NEW ZEALAND
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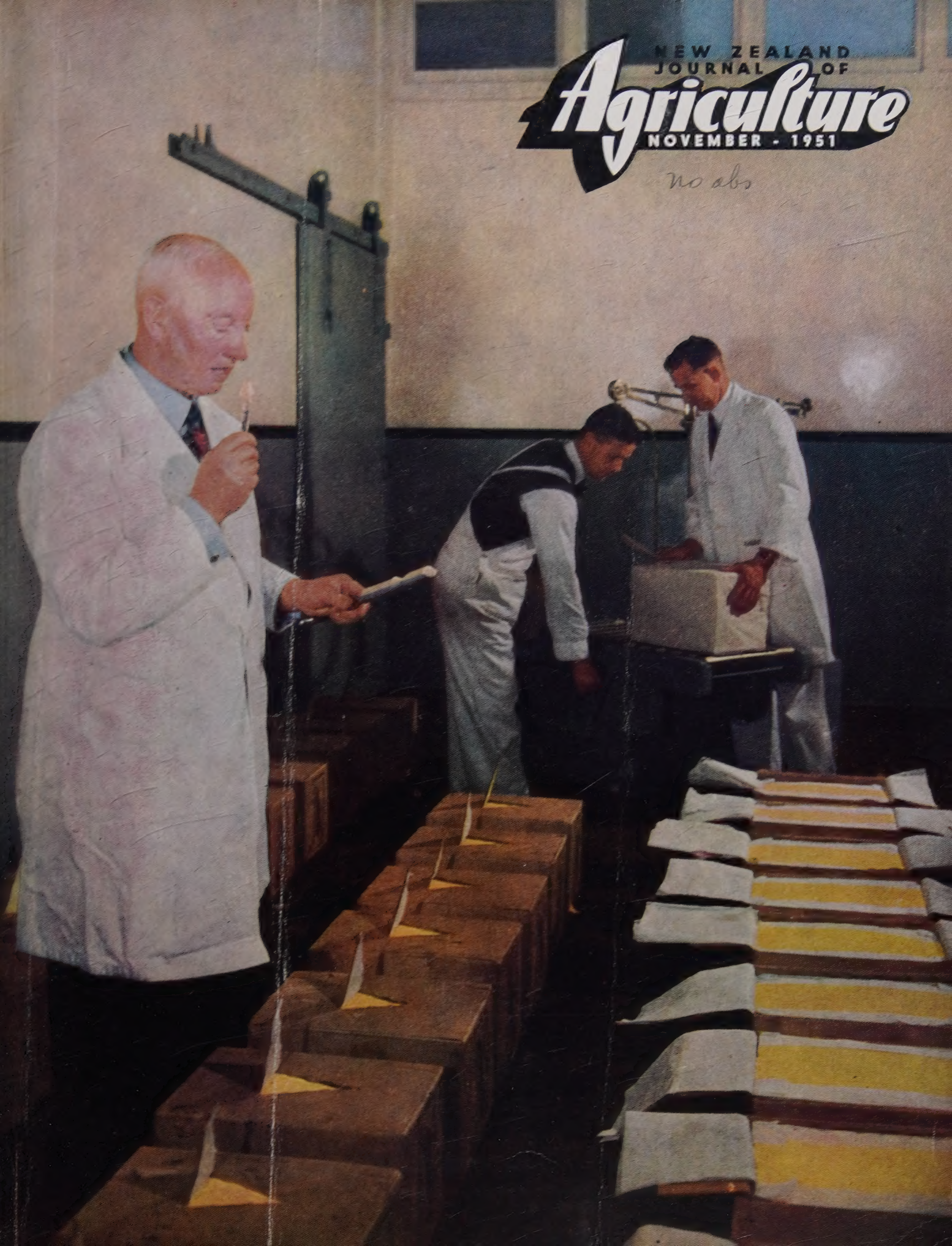

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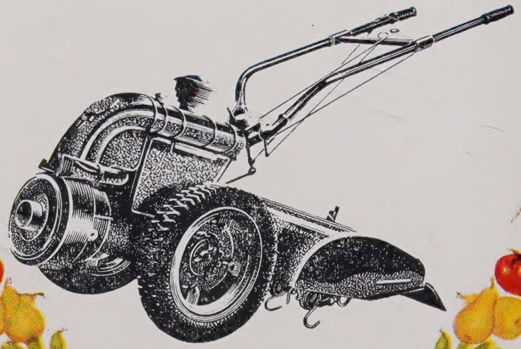

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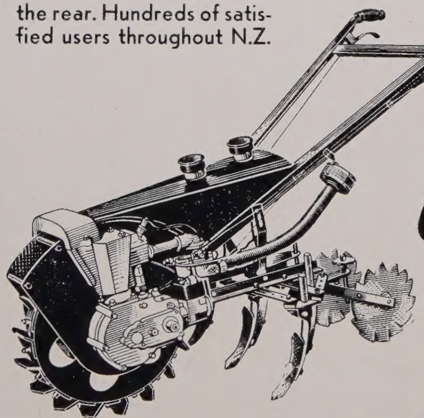

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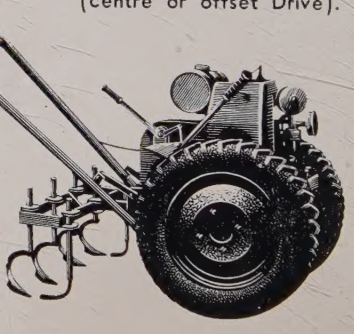

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This Month's Cover

High standards of quality were set for New Zealand export dairy produce in the early years of the industry and adherence to such standards has safeguarded the markets for butter, cheese, and other commodities. Today supervision by officers of the Department of Agriculture extends through all phases of production on farms and in factories to grading at the stores at ports and finally to inspection by officers stationed in the United Kingdom. This month's cover, which has been reproduced from a colour photograph by Sparrow Industrial Pictures Ltd., shows butter being graded at a cool store in Auckland.

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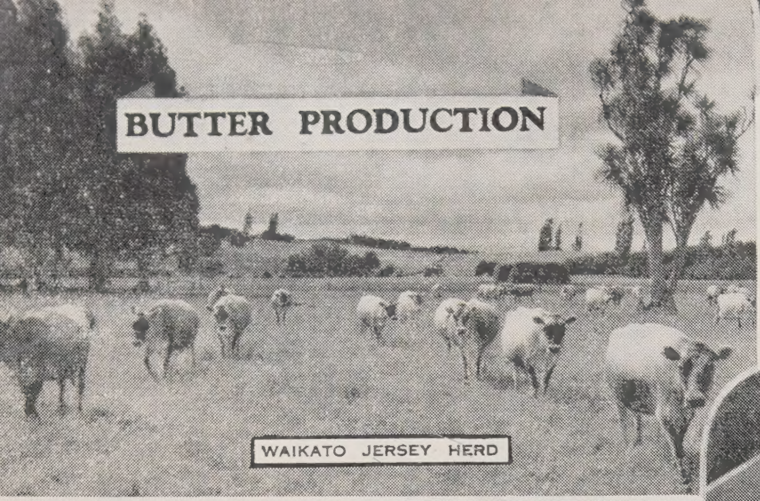
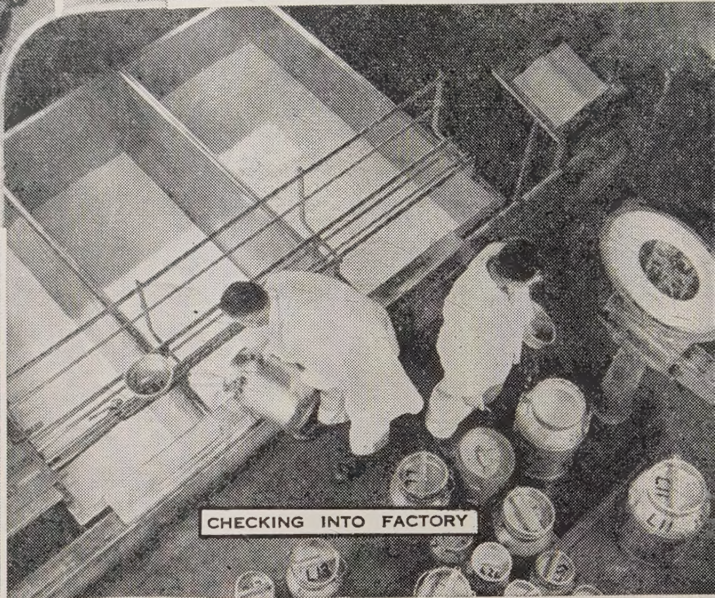
BUTTER PRODUCTION


WAIKATO JERSEY HERD

CREAM COLLECTION AT FARM

SAMPLING CREAM FOR ANALYSIS


CHECKING INTO FACTORY

The fundamental basis of the dairy industry in New Zealand is quality, and for many years no effort or expense has been spared to build up the good name enjoyed in Britain by butter from the Dominion. The industry also has a world-wide reputation for its compact organisation and for the success attained in the adaptation of manufacturing techniques to suit the conditions applying in New Zealand.

[Photographs, except bottom right, by National Publicity Studios.

CHURNED BUTTER

SAMPLING AND GRADING BUTTER

LOADING FOR BRITAIN

The Outlook for Supplies of Fertilisers

WHEN the sulphur crisis developed early this year a conference of superphosphate manufacturers, farmers' representatives, and other interested parties made joint recommendations to me that local fertiliser manufacture for 1951 should be based on an expected allocation of about 52,500 tons of sulphur from the United States plus 10,000 tons to be drawn from our scant reserve stocks and that the sale of straight superphosphate should be discontinued and instead the farmer should be given the choice of three mixtures, each of which contained 75 per cent. of superphosphate.

These recommendations were approved by the Government and were carried into effect, and since February farmers have had, as far as possible, the choice between serpentine superphosphate, lime-reverted superphosphate, and "super. compound". The expected allocation of 52,500 tons of sulphur for 1951 was based on our initial allocation of 13,125 tons for the first quarter, but a supplementary allocation of 2500 tons was later received for that quarter, and subsequent quarterly allocations have been 17,500 tons, 16,600 tons, and 16,000 tons, making a total for the year of 65,725 tons, compared with about 74,000 tons used in superphosphate manufacture last year.

Use of Superphosphate Substitutes to Continue

As soon as our fourth-quarter tonnage was known and it was seen that we would not need to encroach on our reserve stocks it was decided that the full yearly total should be used during the year. This means that manufacturers will have some 3000 extra tons of sulphur to use in manufacture during the last quarter of 1951. On the advice of interested parties it has been decided that the use of the present three substitutes for straight superphosphate is to continue.

The world sulphur position shows little sign of improving before 1954. Much publicity has been given to the discovery of a new dome, workable by the Frasch process, on the Mississippi Delta. This is expected to have an output capacity of 500,000 tons annually. Less widely known are three other new domes which together are expected to yield another 500,000 tons annually. None of these is expected to be in production before 1954, and when they are in operation the additional yield will be largely offset by declining outputs from domes at present being exploited, and the world usage of sulphur is expanding rapidly, partly because of the rearmament programmes of many countries.

Efforts to Obtain Sulphur from New Sources

Efforts are being made in many countries to obtain sulphur or sulphuric acid from new sources; for example, a British syndicate proposes to exploit deposits in South America. Simultaneously industries in many countries are turning to pyrites and other sulphur-bearing materials in place of elemental sulphur, but under present conditions it takes about 2 years to build a pyrites oven.

According to the best advice we have been able to obtain from overseas, the world sulphur deficit, which was about 1,000,000 tons this year, will be about 1,800,000 tons in 1952 and about the same in 1953. Thereafter, through the use of pyrites and recovery from various commercial processes, there should be a progressive improvement, with adequate supplies eventually becoming available, but at greatly increased prices. It is to be expected, however, that users of sulphuric acid will tend to return to the use of cheaper elemental sulphur as soon as it is freed from allocation control. In the meantime we may have reduced allocations and consequently reduced tonnages of superphosphate derivatives.

Need for Farmers to Place Fertiliser Orders Early

The general shortage of superphosphate has resulted in increased world-wide demand for basic slag and North African phosphates, despite higher delivery prices, and farmers who are able to use these types of fertiliser are advised to place their orders with merchants immediately. It would be unwise to look for price reductions, and there is no prospect of a subsidy during the current fertiliser year. Shipments are difficult to arrange, and merchants cannot be expected to bring shipments in unless there are reasonable prospects of selling them.

In this issue there is a summary of Dr. G. L. Bridger's report on fertiliser production in New Zealand. Dr. Bridger's recommendations, which are naturally concerned mainly with long-term developments, are being carefully studied. One of his recommendations was that the existing fertiliser works should continue to manufacture superphosphate and that a pyrites-burning plant at Auckland represented the best prospect of ensuring that enough sulphuric acid would be available. A mission headed by the Assistant Director-General of Agriculture has been in Australia investigating the possibilities of our securing regular shipments of pyrites. Dr. Bridger recommended also that any new works should be designed for processes which did not involve the use of sulphur. The Government and the industry must now examine such problems as comparative cost factors and the provision of the substantial new capital that will be required. Farmers can be assured that the essentiality of adequate supplies of fertilisers is fully appreciated and that plans for the future will be pushed ahead with all possible speed.

K. J. HOLYOAKE, Minister of Agriculture.

Eighteen Men were Killed by Tractors Last Year

AS part of its farm safety campaign the Department of Agriculture collects statistics and details of fatal and non-fatal farm accidents in New Zealand. A sudden rise in the tractor-operator fatality rate in 1949 led to an investigation into such happenings in 1950, of which 18 occurred. As a result of these investigations by officers of the Department of Agriculture and of the Police Department facts have emerged which are reviewed in this article by C. J. Crosbie, Machinery Instructor, Department of Agriculture, Christchurch, in the hope that, being informed of the details of each of last year's fatalities, tractor drivers and other workers with tractors will be acquainted with the circumstances that are likely to lead to an accident that could be fatal and thus be better able to avoid the hazards associated with the operation of their machines.

IN the past 12 years tractors have caused the deaths of nearly 70 New Zealand farm workers, an average annual rate of 5.75 that has increased markedly in the past 2 years, as is shown in the following table.

Year		Total farm fatalities	Fatalities caused by tractors	Number of agricultural tractors
1939	..	21	1	9,639
1940	..	35	3	11,278
1941	..	29	4	12,516
1942	..	27	4	13,967
1943	..	25	8	Not available
1944	..	31	4	Not available
1945	..	28	5	Not available
1946	..	34	5	18,940
1947	..	26	5	21,156
1948	..	Not available	Not available	23,423
1949	..	34	8	27,447
1950	..	55	18	34,684

Eighteen Fatal Accidents

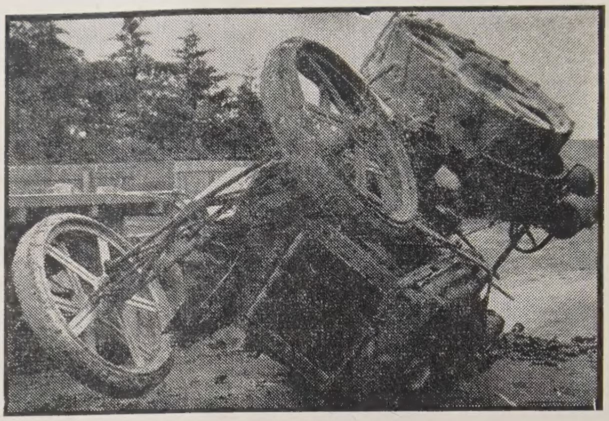
During the calendar year 1950 18 fatal tractor accidents occurred, involving eight track-laying tractors and ten wheeled tractors. Some of these tragedies had no witnesses and the facts surrounding them have been deduced from examination by experienced men of the site, the track marks, and the final position of the tractor, but the following descriptions give as nearly as possible the sequence of events which led to the deaths of these tractor drivers. Some of the fatalities were seen by nearby workers.

Track-laying Tractors

Of the eight track-laying machines involved one unseated its driver, four somersaulted forward or backward, and three rolled over.

How tractors killed 18 people on New Zealand farms last year

	Cause of accident	Type of operation	Nature of country
8 track layers	1 driver unseated	Giant discing scrub	Steep hillside
	4 somersaults	Bulldozing farm road	Steep hillside
		Bulldozing farm road	Steep hillside
		Trying out tractor	Steep hillside
		Topdressing	Fairly steep
	3 roll-overs	Logging in bush	Steep hillside
		Giant discing scrub	Steep hillside
		Giant discing scrub	Steep hillside
10 wheeled tractors	1 somersault	Topdressing	Very steep
	6 roll-overs	Rabbit ploughing	Fairly steep
		Topdressing	Fairly steep
		Topdressing	Moderately steep
		Topdressing	Flat field bordered by creek bank
		Discing	Hillside not considered unsafe
		Discing	Steep hillside
	3 miscellaneous	Backed over man	Flattish roadside
		Drove over bank	Flat field bordered by gully
		Ran over chock	Moderately steep



[*Green and Hahn Photography Ltd. photo.*

One front wheel of this tractor went over the side of the trailer on to which it was being loaded and the improvised ramp shown in the opposite illustration gave way.

1. A driver who had considerable experience with tractors was working a fairly new track layer and a set of giant discs in scrub on rough country. When he did not come home at night a search was made, and his body was found on the side of a hill. He had been run over by the discs. The tractor was found 60yds. away, dug into the side of a hill with its motor still running.

Why the driver fell off the tractor is not known. He was working down the side of a hill and should have made a turn halfway down, but continued straight over a bank. He may have been making a new cut through the scrub, or the tractor may have got out of control at the corner and gone over the bank. The sudden dip of the nose of the tractor going over the bank may have tipped him out, or he may have been stunned by a strong piece of scrub while passing through it and fallen out of the seat.

The fact that the superstructure of the tractor was dented and scarred supported the second theory, and as no adequate scrub bar was fitted to the front of the tractor a heavy piece of scrub could have passed back between the tracks and the motor until it was struck by the equaliser spring. Though it may be argued that this spring would push the scrub forward, a sizeable tree with weak roots could be displaced at its roots so that the head falls backward. The tractor had a short scrub bar fitted to protect the motor, but it did not extend the full width of the tracks, as is necessary for complete protection.

2. A track-laying tractor fitted with a bulldozer blade was engaged to form a road on the steeper portion of a hill farm. After completing the job the driver dropped the blade and proceeded to pull out some stumps. On the completion of this work he was returning uphill to pick up the blade and struck a sharp ridge which caused the tractor to somersault backward, falling on the driver and crushing him.

He had travelled up this slope before, but on previous occasions had missed the ridge that caused the tractor to somersault. On previous occasions, too, the blade had been fitted to the tractor, and on this occasion its absence may have been a contributing factor to the fatality in that when fitted its weight would tend to keep the nose of the tractor down.

3. An experienced driver on a new track-laying tractor harrowed a field and on completion of the work unhooked the implement and drove to a gully, where he tried to negotiate a steep hillside. There was no reason for this, and it is presumed that the driver wanted to try out the tractor on a hillside.

When the machine was nearing the top of the hillside the left track began to burrow in and prevented the

Review of Investigations into Fatalities

[*Green and Hahn Photography Ltd. photo.*

This insecure planking between loading bank and trailer caused the accident. Two men, one steering and one working the hand clutch, jumped clear and escaped injury.

tractor from proceeding. This burrowing weakened the ground and scooped earth out and down the hillside, leaving the rear of the tractor suspended in the air. It is considered that the driver reversed the tractor with a view to slewing it round for a fresh track up the hillside, but it capsized backward and crushed him to death. The tractor capsized again and ran down into the gully; the exhaust pipe was found driven 18in. into the ground a few yards down the hill.

4. With a small track-laying tractor and a topdresser, a driver was working round and round a field on a fairly steep grade. While working directly uphill he met a cutting about 2ft. high such as would result from a small slip or an old sheep camp on the side of a hill. He tried to negotiate the cutting by driving the tractor head on to it, but the attempt failed. He allowed the tractor to run back a few yards and then, with full throttle, tried again. The front portion of the tracks mounted the cutting, and the machine reared in the air and fell back on top of the driver.

5. A farm road was being cut with a track-laying tractor fitted with a bulldozer blade and the machine had become stuck so that it could not back. A man riding on the drawbar of the tractor instructed the driver to drive forward, round and down over the bank of earth recently formed. The machine travelled fast down the slope of loose earth. The blade caught on a punga root, causing the tractor to capsize, and the man on the drawbar was thrown forward to be crushed by a track when the machine somersaulted.

The superstructure of the bulldozer blade and a canopy over the seat saved the driver from serious injury.

Tractor Safety Rules

Do not dismount from a tractor without disengaging the power take-off shaft. Keep revolving shafts and axles covered with the shields provided.

Engage the clutch only from the driver's seat, and do not dismount from a moving tractor.

Drive at speeds low enough to ensure safety, especially over rough ground or near ditches.

Reduce speed before making a turn or before applying brakes.

Do not permit persons other than the driver to ride on the tractor when it is working.

Do not stand between the tractor and the drawn implements when moving the tractor backward or forward in hitching; it is safer to use an iron hook or similar aid to handle the drawbar from the tractor seat.

Exercise special care when making sharp turns and fit longer hitches where necessary.

Be certain the gear-shift lever is in the neutral position before cranking the engine.

Engage the clutch gently, especially when going uphill or pulling out of a ditch.

Ride only on the seat and never on the tractor drawbar or the drawn implement.

When attaching the tractor to a stump or heavy load hitch to the drawbar. Do not take up the slack with a jerk.

Keep the tractor in gear, preferably a low gear, when driving down steep grades.

Do not put on or remove a driving belt while the pulley is revolving.

Be careful in removing the radiator cap if a pressure cooling system is used or if the motor is overheated.

Do not refuel a tractor with the motor running or while it is extremely hot.

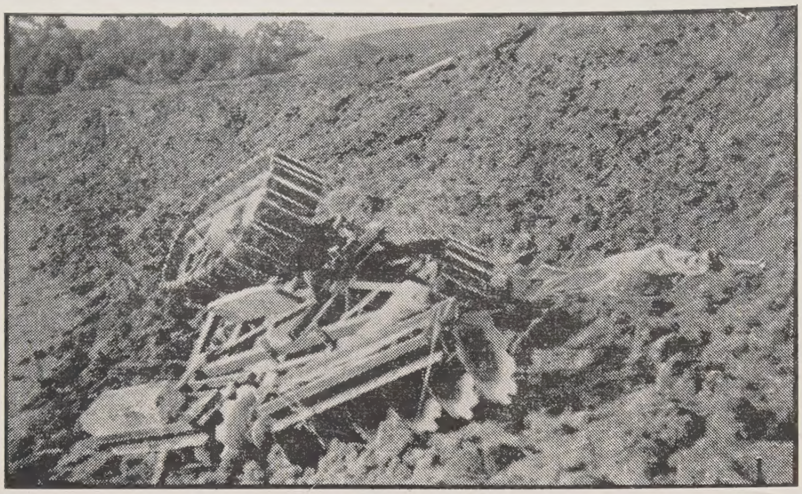
This advice may convey the impression that driving a tractor is complicated and dangerous, and it certainly is dangerous if the driver does not use common sense. He should never be in too much of a hurry to be careful. He should think before he acts and familiarise himself thoroughly with the machine he is using.

How 375 people, Maori and pakeha, were killed on New Zealand farms in 12 years

Causes	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	TOTALS
Machinery (all types)	9	10	10	3	3	4	2	5	5	Not available	2	4	57
Tractor and bulldozers	1	3	4	4	8	4	5	5	5		8	18	65
Horses	2	6	5	9	1	6	4	4	8		3	3	51
Trees	4	11	4	3	4	4	1	1	2		4	2	40
Carts, sledges, and trailers		1	3	1	5	4	4	7	2		1	3	31
Bulls	2	4	2	4		1	1		1		1		16
Haystacks, stackers, and pitchforks	2			3	2	3	3	1	1			1	16
Explosions while blasting (includes forestry fatalities)						1	7	10					18
Sheep and cows	1		1			2		1					5
Electricity					2				2		3		7
Drownings											6	11	17
Gunshot											1	7	8
Fires and chemical burns											2	1	3
Aircraft												2	2
Miscellaneous						2	1				3	3	9
Totals	21	35	29	27	25	31	28	34	26	*30	34	55	†345

* Estimate

† This does not include the 30 fatalities estimated for 1948



The driver was killed when a track-laying tractor and set of giant discs rolled over and over while he was working steep, scrub-covered hillsides. He put the lower track over the edge of a bench, causing the tractor to pass its tipping angle.

6. A tractor rolled over during logging operations in steep bush country and the driver was killed. He was hauling a log weighing about 5 tons out of the bush, when apparently the log rolled, taking tractor and driver with it down the side of a steep hill. The accident was not discovered until later.

7. With a track-laying tractor and a set of giant discs a driver was working a steep hillside. He had traversed the hillside, travelling slightly uphill, and was recutting half the same piece on the return trip, this time travelling slightly downhill. From the track marks after the accident it was apparent that the lower track of the tractor went over the outer edge of a bench so that the machine passed its tipping angle and rolled over.

It appears that this driver had had little experience with track-laying tractors, and there is some doubt whether an experienced driver would have disced this hillside in the same way.

8. A third track layer that rolled over and killed its driver was also being used for giant discing on steep country. In attempting to negotiate a bench the driver put the tractor on such an angle that it passed its point of balance and rolled over.

Wheeled Tractors

Of the ten fatalities resulting from wheeled-tractor accidents one was caused when the tractor somersaulted backward, six when tractors rolled over, and three in other ways.

9. A rubber-tyred tractor fitted with extension wheels was driven down a very steep and broken hillside with fertiliser for topdressing. While endeavouring to climb back up again the tractor reared and somersaulted on top of the driver, pinning him beneath it.

The hillside was striped with stock tracks and ledges with almost perpendicular drops of 2ft. 6in. to 3ft. between them. The average slope was of the order of 1 in 2.

10. A rubber-tyred tractor with a topdresser attached was being driven down a fairly steep grassy slope coated with frost. The speed of the tractor at this stage was reported as "rapid". The driver applied the brakes evenly, but the tractor continued on. It is surmised that when nearing the bottom of the slope the driver turned left to avoid a depression in the field, and in turning at speed the tractor capsized, rolling over twice. The driver was crushed and received injuries from which he died in hospital that night.

The rear tyres of the tractor were inflated at about 15lb. pressure and the treads were in almost new condition, with deep rubber cleats.

11. A second wheeled tractor mounted on rubber tyres that rolled over when turning at speed and killed its driver was also engaged in topdressing on a hilly field of grass which was 8 to 9in. high. It was being worked downhill on a slope of 1 in 5 or 6 when it became out of control. The right-hand brake held for most of the way down and the left-hand brake for only some of the way. At the bottom of the slope near a gate it made a sharp right-hand turn and rolled over, crushing the driver.

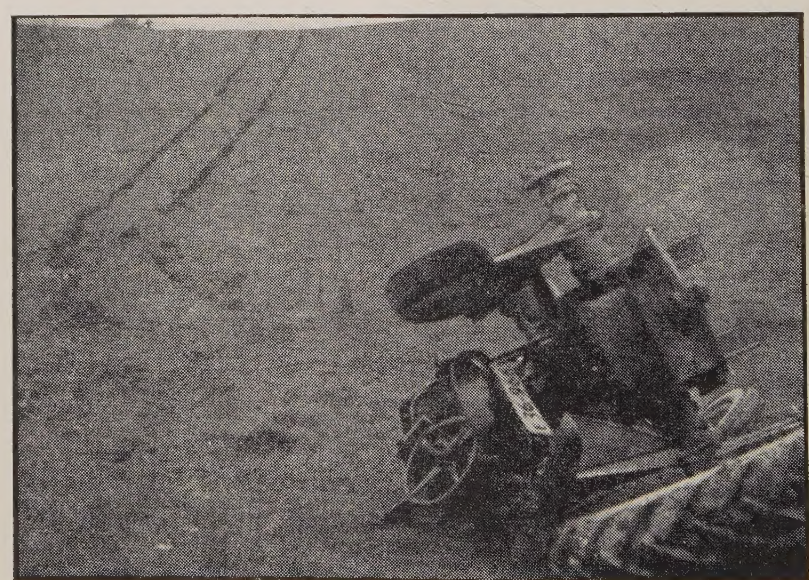
The tractor was found in second gear after the accident.

12. While the driver was negotiating a fairly steep slope when ploughing a shallow furrow preparatory to laying bait for rabbits, a rubber-tyred tractor started to skid on a greasy surface toward a steep, gorse-covered sidling. When the rear wheels skidded over a bank about a foot high the tractor apparently reared, slewed round, and rolled over one complete turn before skidding further down the sidling.

The total distance of the first skid, the roll over, and the second skid was about 25yds. The driver was found halfway down the slope dead from head injuries received when the tractor rolled on him.

13. A driver topdressing a fairly flat field with a rubber-tyred tractor and a topdresser was following round a creek bank which bounded the field. For 10 chains he drove dangerously close to the edge of the bank. At the point of the accident the creek made a decided bend, and the driver got the front wheels of the tractor over the bank while negotiating the turn.

He unhooked the topdresser and pushed it clear, remounted the tractor, put it in reverse, and endeavoured to back out. The rear wheels skidded on the greasy surface and the tractor slipped over the bank, pinning the driver under the water.



With a topdresser attached, this tractor became out of control on a steepish, frost-covered hillside and, when making a sharp turn at speed, rolled over twice, fatally injuring the driver. A rear wheel was removed for repairs before this photograph was taken.

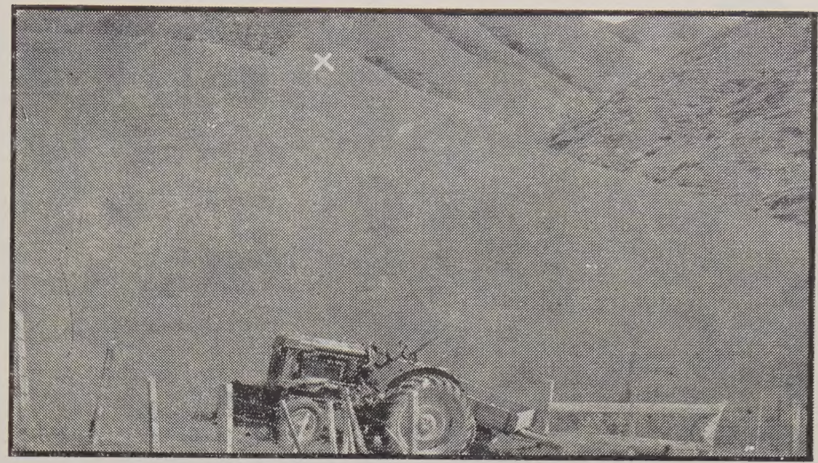
14. A new wheeled tractor was delivered to a farmer on the afternoon of his death. His son was discing with the machine without trouble on a hillside that was not considered unsafe for wheeled tractors when the farmer, who had had no tractor experience, took over the controls. He crossed the hillside at right angles to the line of slope and passed out of sight of the son. When he did not return in the expected time an investigation was made and he was found dead, pinned by the neck to the ground by the rear mudguard of the tractor, which had overturned.

In the corner of the field he had tried to make a sharp right-angle turn uphill and had got partly round, but could not make the full turn. He had reversed the tractor preparatory to trying the turn again, but the rear wheel rode up on the drawbar of the discs so that the tractor overturned on him and he was asphyxiated.

15. During discing on a steep slope with a rubber-tyred tractor the discs struck two gorse roots. The first, a small one, caused the discs to swing, and while they were swinging they struck the second and larger root, which caused the discs to turn over and take the tractor with them.

It would appear that the tractor was already on an angle approaching the tipping point and that the upsetting of the discs was sufficient to roll the tractor over.

16. A farmer was killed by a tractor which backed over him when the driver was manoeuvring it while cutting scrub on the side of a road with a mounted gorse cutter. It appears uncertain whether the farmer was riding on the back of the tractor and fell off or whether he was standing on the ground when the tractor backed over him. The rear wheel passed over his head, killing him instantly.

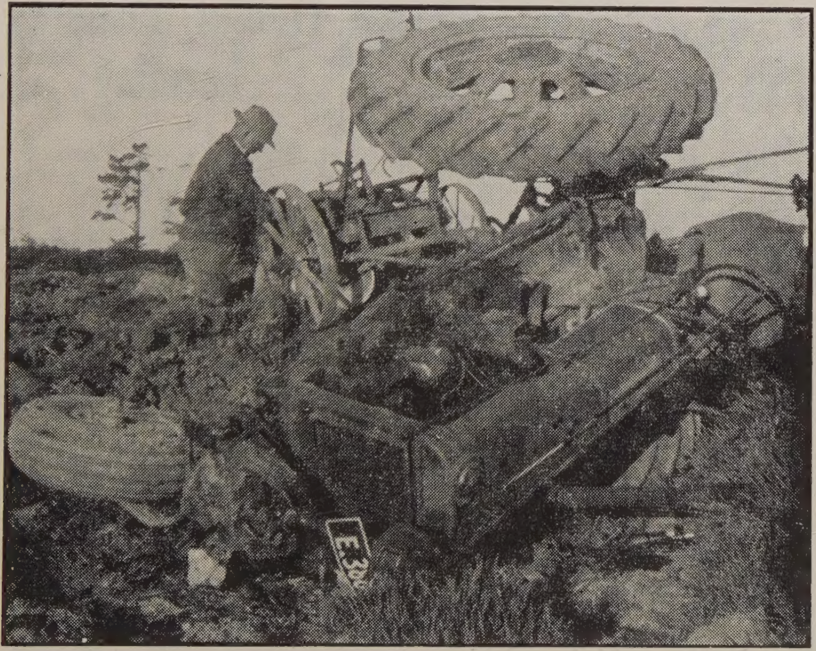


This tractor became out of control while being used for topdressing on a steepish hillside covered with grass 8 to 9in. long and, when making a sharp turn at speed, rolled over and killed its driver. Skid marks starting beyond the cross in the background showed that the brakes were applied, but they failed to hold the tractor.

17. A man known to be a careful and if anything a slow driver was collecting dead sheep from a flat field with a rubber-tyred tractor and a sledge and tipping them into a gully. He collected and disposed of one load safely, continued on and collected another load, and returned to tip it from the opposite direction, almost following in the wheel marks made on his outward journey. Approaching the spot where he had tipped the first load he had to drive up a short, steep mound, and to do this he probably increased speed. He would have little vision while going up the mound and when on the top would have to turn sharply right to avoid driving over the bank.

He apparently reached the top of the mound and braked the right-hand rear wheel to turn right sharply, but as he did so either the left front wheel was almost over the bank, which gave way, or his tractor broadsided and went over on its left side, rolling over and over until it reached the bottom of a 40ft. gully. The driver was pinned under the tractor, which was extensively damaged, one rear wheel being broken off and the other buckled and the front wheel assembly being crushed out of alignment.

The tractor had been thoroughly tested by mechanics a few days before the fatality and to suggest any mechanical fault was unreasonable.



While endeavouring to plough "that last furrow" on the edge of a riverbank, the driver of this tractor put a rear wheel into a hole concealed in long grass. The machine rolled on to its side, but the driver was thrown clear and not injured.

18. A tractor and a hay baler were being driven down a slope to be used for stationary baling from a stack of hay. When the driver stopped the tractor the weight of the baler was too great for the tractor brakes to hold the two units, so he dismounted from the tractor and placed a chock in front of one of the tractor's rear wheels. The tractor rode over this chock, and while endeavouring to place it in front of the wheel again the driver slipped. The wheel passed over his head, inflicting injuries from which he died shortly after entering hospital.

Other Facts

Age of drivers: The drivers in the fatal accidents detailed were between the ages of 20 and 64, the average being 39. Six were between 20 and 30, five between 30 and 40, two between 40 and 50, four between 50 and 60, and one was more than 60 years of age. Thus the popularly held view that drivers younger than 20 years are being killed because of inexperience and recklessness is not supported by the facts of last year's accidents or by those of the eight fatal tractor accidents that occurred in 1949, when the victims' ages ranged from 22 to 54.

Experience of drivers: The driving experience of all the 18 men killed is not known, but one driver operating a tractor on a slope was totally inexperienced, and another driver of a track layer operating on steep country had less experience than was desirable in the circumstances.

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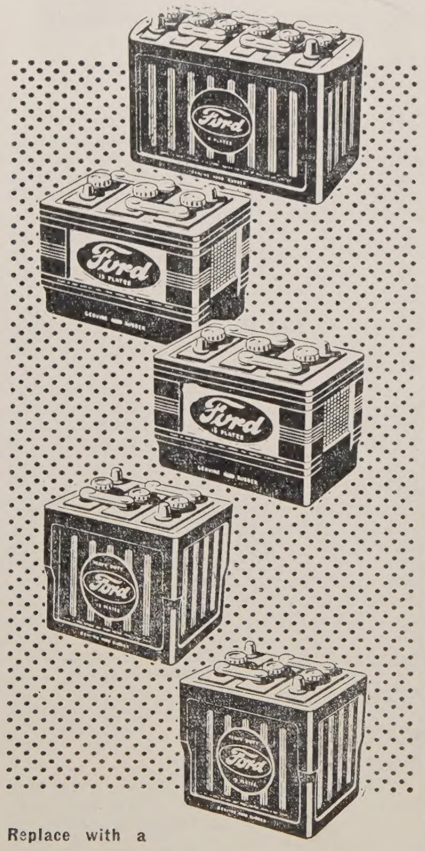

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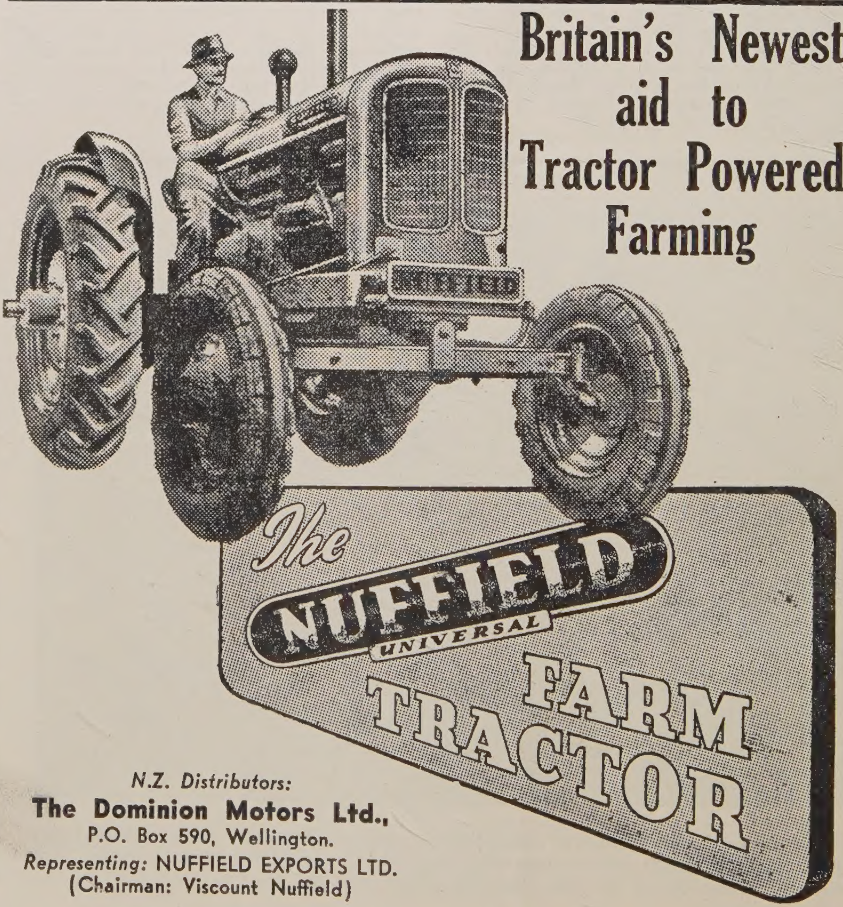

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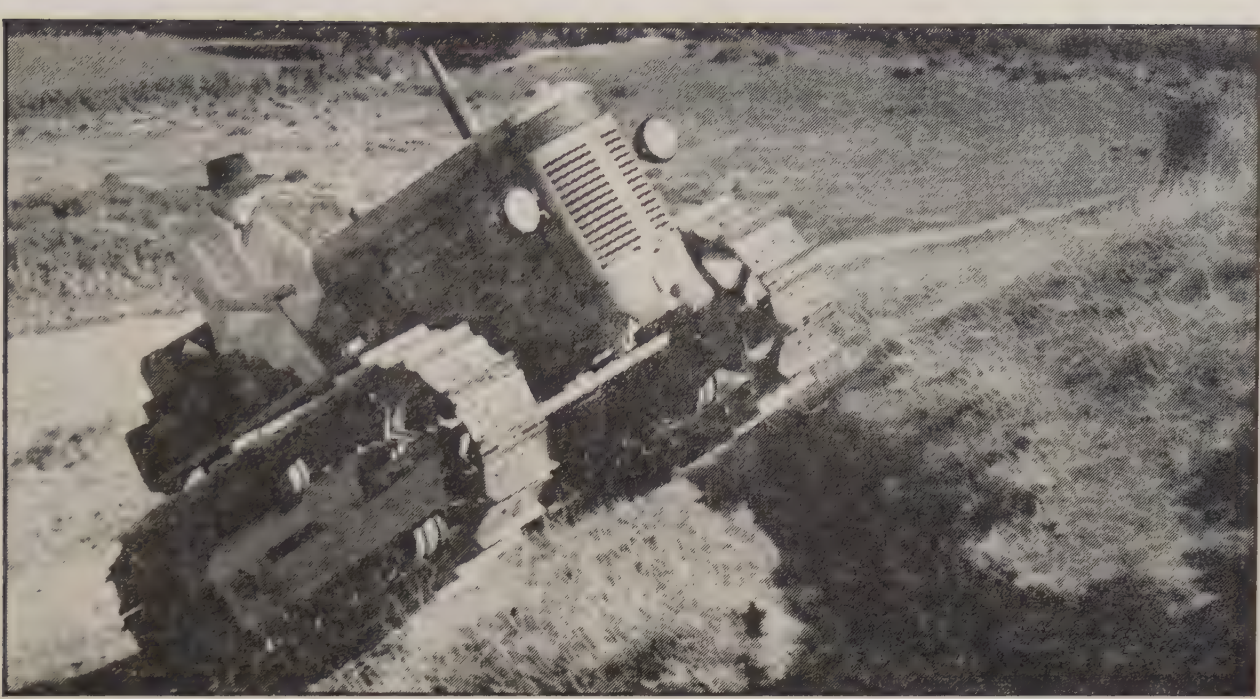

[*Green and Hahn Photography Ltd. photo.*

Had this cattle track been obscured in scrub and the tractor met it from above, putting the lower track into the sudden dip would have sufficed to have rolled the machine over.

Makes of tractors: The makes and models of most of the tractors involved are known. Nearly all the well-known makes of wheeled and track-laying tractors, whether manufactured in the United States of America or the United Kingdom, were involved, but no one make or model any more than another.

Mechanical faults: Every tractor involved was inspected after the accident for evidence of mechanical fault, but in no case was it established that the tractor was at fault, though in a few of the cases the tractor was so badly damaged in the accident that it was impossible to determine if any part had broken before the accident and thus caused it. On the other hand, many of the tractors were virtually unharmed apart from such minor defects as damaged mufflers and bent steering columns, and in some cases the motor was still running when the accident was discovered. Further, many of the tractors were either new or recently delivered on the farm, making it unreasonable to suspect faults arising from such causes as wear, excessive use, and faulty maintenance.

Working on Hilly Country

Of the eighteen tractors involved, five somersaulted backward or forward, nine rolled over sideways, one ran over a chock, one ran over a bank, one backed over a man, and one unseated its driver. Thirteen tractors were operating on fairly steep to steep hill country, two on moderately steep country, and three on fairly flat fields or roads.

There is a widespread belief that track-laying tractors are "safe" on hill country, but that is disproved by last year's tractor fatalities. A track-laying tractor is no safer on steep, hilly country than is a wheeled tractor on rolling country, for no great lift is needed to roll either over.

A track-laying tractor with its low centre of gravity is close to its tipping angle on steep hilly country, and when the bottom track falls into a depression or the top track passes over a stump, log, or stone the tractor may exceed its tipping angle and roll down the slope. The same applies to the wheeled tractor with its higher centre of gravity when it is on rolling country, a fact realised by most tractor drivers, who exercise extreme care on such slopes. That drivers of track-laying tractors on steep hill country do not generally appreciate the safety limits of their machines is borne out by last year's fatal accidents.

Only track layers with the widest track gauge available should be operated on steep hill country, and then only with extreme care.

Drivers' Errors Responsible

In the absence of evidence that mechanical faults in the tractors contributed to the fatal accidents reviewed, it appears that they were all caused by the human element—that some aspect of the driver's control over the machine contributed largely to the accident, whether it was inexperience, taking of an unnecessary risk, an error of judgment, misadventure, or carelessness or negligence.

A tractor driver's life and the lives of other people working with his machine are largely in his hands from the time he climbs on his machine. Only by strict observance of safe driving practices can he hope to go through life without being involved in at least one serious accident, and in recent years accidents have shown an increasing tendency to end in fatalities. Age and experience do not necessarily lead to immunity in tractor driving.

Effect of Fatigue

A factor not investigated was the incidence of fatigue and its bearing on the occurrence of accidents. Probably fatigue with its associated lack of care —the tendency to take risks and the general loss of appreciation of the safety factor—had quite a large bearing on the occurrence of some of the accidents.

It is advocated that tractor drivers should observe regular hours of work and have morning and afternoon breaks and a reasonable lunch hour. At no time should a tractor driver be induced to speed up a job above the rate of work normal in the circumstances. In their own interests tractor drivers should not agree to work long hours under difficult conditions because of fatigue, and because every faculty must be on the alert they should not take out machines when in poor health.

Lone Tractor Drivers

A disturbing feature of several of last year's tractor fatalities was the long period between the accident and its discovery. In some cases only when the driver did not come home for tea was a search made after dark to discover the reason. Had some of the accidents been discovered earlier, enabling prompt medical attention to have been provided, drivers who died from injuries might be alive today.

Last year a driver was pinned by a leg under his tractor for 4 hours before he was discovered and released. Luckily the leg was not broken and no major arteries were severed, so he made a good recovery in hospital.

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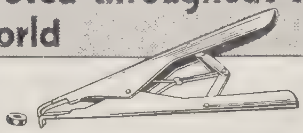

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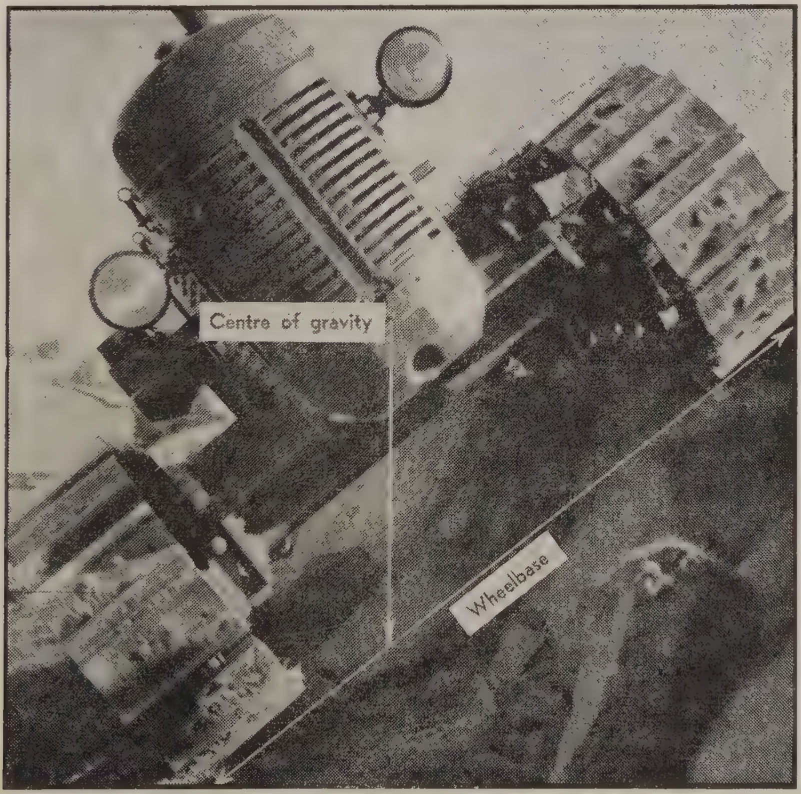
Some years ago a driver who was drawn into an unprotected power take-off shaft by his coat becoming wrapped around it lay for 2 hours entangled around the shaft before he was discovered and his clothing cut away from it. The tractor was only idling when the accident happened and the engine stalled, but he received multiple injuries to the ribs and severe damage to the spine from which he has not recovered fully.

It is strongly recommended that whenever possible another man should be working near a tractor driver who is operating his machine in circumstances that reduce the safety factor.

Inspection of Land

On occasions when an accident has occurred during the breaking in of steep, scrub-covered hillsides it has been reported that if the area had been inspected before it was worked, and the hazards marked so that they were visible to the tractor driver, the accident probably would not have happened. That this preliminary inspection pays handsome dividends is evident from the following example.

Over a period of 3 years three track-laying tractors and several teams of horses broke in an area of about 4000 acres of scrub-covered pumice land, and while this work was being carried out no serious tractor accident occurred because before each block was worked it received a preliminary inspection by men who marked each hole with flagged poles that would be visible to the tractor drivers. The holes, varying in size from 10 to 12ft. across to those just coming through that were only a foot across, were caused by subsidences over underground streams. These subsidence holes followed fairly well-defined lines through the country and the danger area was not confined to the holes at the surface, but extended to the land in the line of the underground streams, where subsidence might occur under the weight of the tractor. With the danger area flagged before work was begun, the hazard was obvious to the tractor drivers and no serious accidents occurred during 3 years' work, though it is reported that one tractor and driver were nearly lost down a deep hole where the subsidence line had been missed by the men flagging the area.



A tractor on a hillside will not roll over if an imaginary vertical line through the centre of gravity of the machine falls within the wheelbase.

The lifting lever of this cultivator flew forward and broke the neck of the driver, killing him instantly. When the rear wheels passed from firm, unploughed ground into the furrow most of the weight of the tractor fell on the cultivator. As the tines would not enter the hard ground, undue forces reacted up through the lifting mechanism, causing the pawl on the lifting lever to slip out of the quadrant.

Fatalities Caused by Equipment

As well as the 18 deaths which they caused in 1950, tractors were associated with but not the direct cause of another seven fatalities.

A tractor driver was hit in the face and fatally injured when a pawl of the lifting lever of a tractor-mounted mower slipped out of place in the quadrant, allowing the lever to fly back. A short time before the fatal happening the same lever had slipped out of place and hit the same driver on the head, stunning him, but he had been able to stagger home before he collapsed. Temporary repairs had been carried out on the lever, but the driver was far from satisfied with it on the day he started mowing hay and met his death.

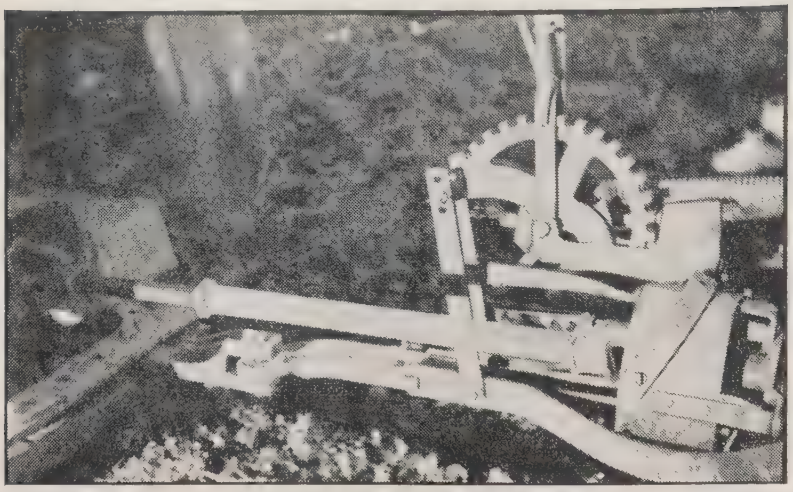
A child who was being given a ride in a tractor-drawn trailer was cautioned to sit down, but apparently stood up and fell out of the trailer in front of the wheel.

The driver of a direct-mounted tractor cultivator died of a dislocated vertebra when he was hit on the neck by the lifting lever of the cultivator. The tractor passed over some hard, unploughed land, and when the rear wheels dropped into a furrow the weight of the tractor rested on the rear-mounted cultivator. The ground being too hard for the cultivator tines to enter it, undue forces reacted upward in the lifting mechanism and caused the pawl to slip out of the quadrant, allowing the lever to fly forward.

In two instances last year, one in the North Island and one in the South Island, a child riding on a tractor-drawn field roller fell in front of the roller and was fatally injured. The two boys were aged 13 and 9.

A stacker pole broke and fell and killed a farm worker when the tractor lifted a grab load of silage that was too heavy for the pole.

A driver was killed when he was pulling over a tree with a tractor. The chain broke and a limb of the tree swung round and struck him on the head.



This photograph, taken in a potato field last winter, shows how a driver endangered his life by neglecting to cover the power take-off shaft with the shield provided by the manufacturers for his protection.

All the case histories quoted concern drivers, farm workers, or farm children who were killed or fatally injured in accidents associated directly or indirectly with tractors. Following are brief details of some non-fatal tractor accidents that occurred in 1950:—

A driver was hauling logs with a tractor when the rope broke and flew back, injuring his face.

A driver's face and hand were injured when his clothing became caught in an unprotected tractor power take-off shaft and drew him into it.

A driver and a farm worker riding on a tractor received a broken leg and concussion respectively when the tractor overturned.

When the tractor overturned and fell on him a driver received a fractured spine.

A driver who fell from a tractor received concussion and facial injuries.

While helping to extract a tractor from a bog by placing posts under the wheels, a man was hit in the stomach when the wheel suddenly gripped a post and threw it out behind the tractor.

When his tractor overturned a driver was pinned by the leg for 4 hours before he was discovered and released. His leg was not broken and he received no serious injury.

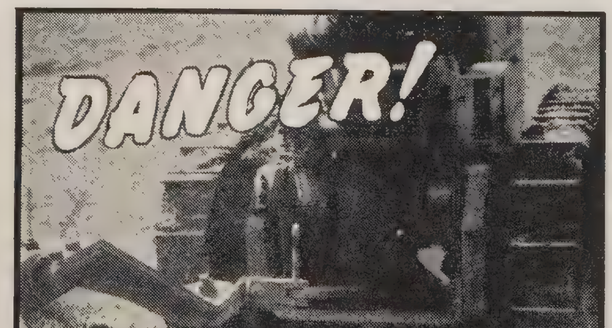
A driver received a broken hip when a truck collided with his tractor on a corner of a road and overturned the tractor.

Falling off his tractor into a rear-mounted mower, a driver received a broken leg and multiple cuts.

In Canterbury alone, four drivers or passengers on tractors are known to have lost portions of their clothing when their trousers became entangled in uprotected power take-off shafts between tractors and trailed mowers. Another driver allowed his scarf to flap into a revolving unprotected power take-off shaft. Manufacturers of mowers operated by power take-off provide shields for the shaft for the express purpose of protecting tractor drivers and farm workers, and the shields and the tractors all carry transfers urging that the shields be in position before the machines are set in motion. Failure to have them fitted when the machines are at work is gross negligence.

The list of non-fatal accidents is not complete, but figures received from insurance companies indicate that last year there might well have been more than 100 tractor accidents sufficiently serious to warrant paying out compensation claims and that the total of these claims would be from £7000 to £8000.

No records or calculations can show the number of accidents that occurred in which little or no injury was suffered by the driver, such as that last year when a tractor driver was thrown clear and able to watch his tractor roll down a steep hillside and break in halves, the two sections coming to rest several yards apart.

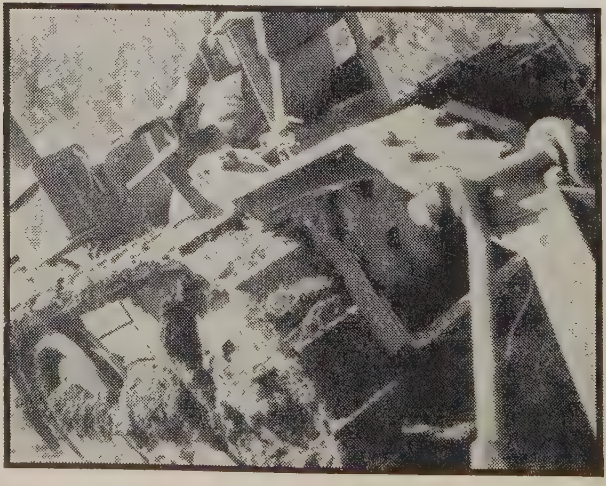


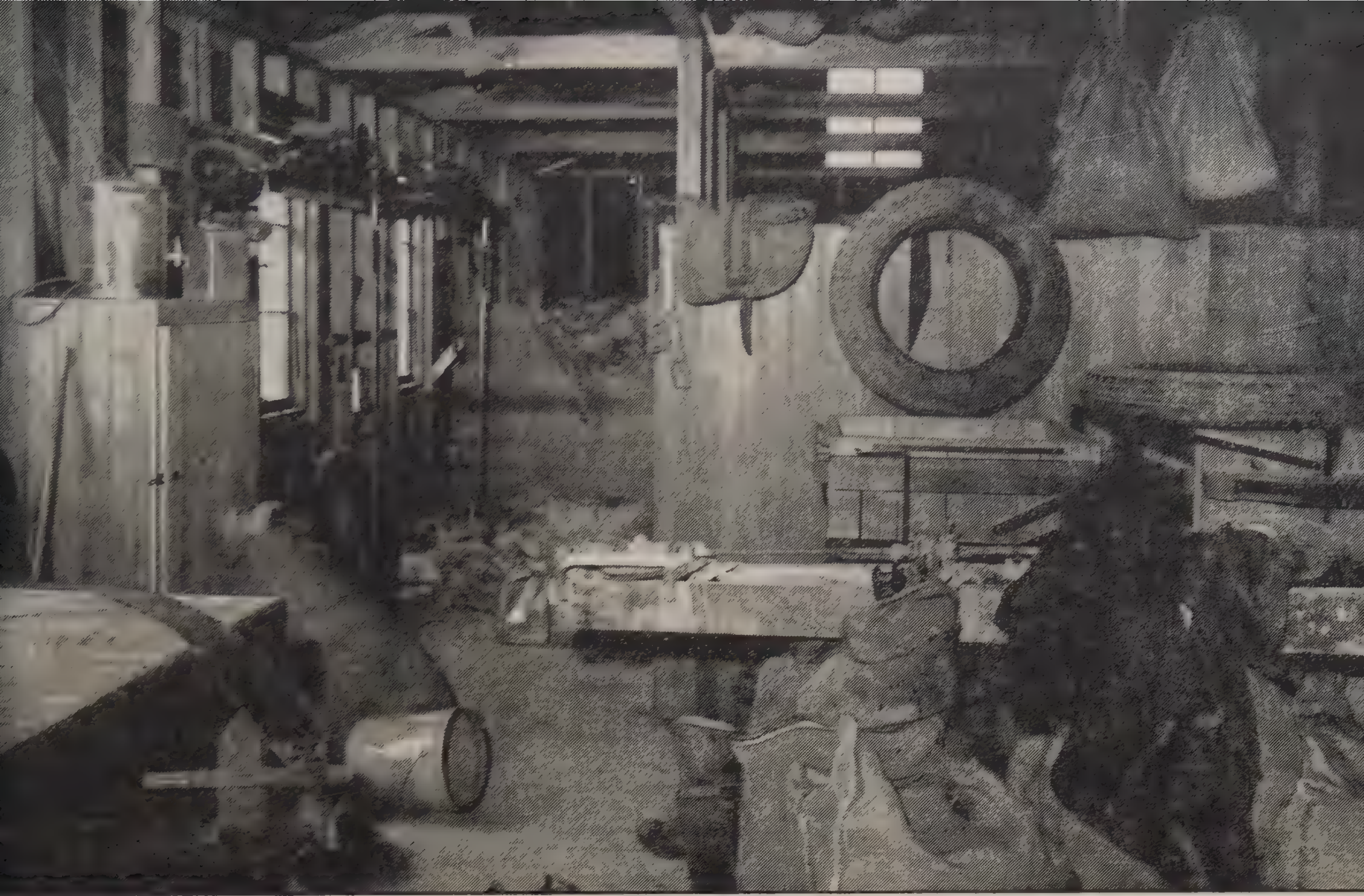
A HAPPENING at a demonstration of farm tractors showed the serious consequences that can result from makeshift repairs to machinery. Early in the demonstration the bracket securing the drawbar to the cross-member was broken off and the drawbar fell to the ground. Instead of carrying out repairs with the correct spare parts, the operator altered the drawbar so that it lay on top of the cross-member, but was not secured to it, as in the upper illustration. This expedient sufficed for some classes of work on the flat, but when the tractor was working downhill the front end of the set of discs attached rose and the drawbar slewed to one side, fouling the tracks so that it was quickly carried up close to the driver, as in the lower illustration, with grave risk of serious injury to the driver.

Fortunately plenty of assistance was available and the discs were released, but had the driver been on his own, he might have endangered his life again in correcting the tangle.

When breakages occur they should be repaired with the correct spare parts. Makeshift repairs or adaptations cause accidents that may be fatal.

—*K. M. MONTGOMERY, Fields Instructor,*
Department of Agriculture, Te Kuiti





Hygienic Precautions in Sheep-farming Operations

THE sheep is particularly susceptible to certain bacterial infections, germs of which most readily enter its body through cuts and bruises. Many of these germs live in soil and dust, frequently in the fleece and on the skin of the sheep. Shearing sheds, yards, holding paddocks, and similar places where large numbers of sheep are frequently brought together become heavily contaminated with bacteria, and among the diseases which may originate in such conditions are blackleg, blood poisoning, tetanus (lockjaw), caseous lymphadenitis, suppurating wounds, and abscesses. This article by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin, recommends hygienic measures which, if applied carefully and thoroughly during shearing and other routine operations on the sheep farm, will do much to reduce the incidence of those diseases.

PREPARATION of the shed, yards, machines, and other equipment should be started early enough to allow the work to be carried out thoroughly before shearing is begun. When shearing has been completed the same cleaning routine should again be carried out.

Yards and Pens

Yards can be a serious source of infection, and concrete yards are a great advantage because they are easily kept clean and greatly reduce the risk of infection. In the usual type of earth yards dust formed of dried earth mixed with ground-up manure is frequently laden with disease-producing germs which contaminate cuts and wounds in the sheep's skin. In earthen yards it is a sound practice to lay the dust by spraying or sprinkling it with water before yarding sheep and at frequent intervals while they are in use. Such yards can be improved by the use of gravel on the ground.

When new yards are being made careful planning to ensure good drainage is worth while. In some limestone and sandstone country a very good yard surface can be made by removing the few inches of surface soil.

The most important sources of infection are the counting-out pens, where a freshly cut sheep is most likely to be infected if germs are present. Counting-out pens should always be concreted and the expense and labour are well worth while. Particular attention should be paid to cleaning of counting-out pens before shearing and to keeping them clean and free from manure while they are in use. Germs do not survive on a hard, smooth surface like concrete which is clean and

Above—An untidy shearing shed, particularly bad features of which are "dead" wool thrown to one corner of the shearing board and sheepskins hanging above the board. Below—Scrubbing the shearing board with a solution of detergent or washing soda removes dirt and grease efficiently.

Spraying the shearing board with disinfectant. Walls around the board, chutes, and catching, holding, and counting-out pens should be included.

exposed to the sun and fresh air. Therefore counting-out pens under the board or otherwise shaded from sun and fresh air are unsatisfactory, having the added disadvantage of being very difficult and sometimes impossible to keep clean.

Sharp or jagged edges of rails, pieces of wire, projecting nails, and other objects likely to wound sheep should be removed or repaired.

Biting dogs are another source of infection in yards and pens. A number of cases of blackleg are known to have originated from dog bites.

Cleaning the Shearing Shed

To avoid increasing the risk of infection in a shearing shed carcasses of sheep which have died should not be brought to the shed for plucking, skinning, or keeping for dog food, and their skins should not be hung in the shed; in fact, keeping any sheepskins in the shearing shed is undesirable. Dead wool and crutchings should be bagged as soon as possible and preferably not be kept in the shearing shed, but if that is unavoidable, they should be stored as far as possible from where the sheep will be. Diseased sheep should not be brought to the shed or yards.

Thorough cleaning and tidying of the shed are necessary before shearing time, for dirt, grease, and dust protect germs from sunlight and fresh air, which help to destroy them, and from the action of disinfectants.

Dust should be dislodged from rafters, walls, and ledges above and around the shearing board. Running the machines for a short time enables them to be checked for mechanical faults and at the same time dislodges much of the dust. Rafters, ledges, and walls should be swept with a broom and the entire shed swept out thoroughly. Accumulations of manure should be removed from the holding and catching pens. Thick accumulations of grease or dirt on the shearing board are best scraped off with a spade.

The next step is a thorough scrubbing of the shearing board. Edges of ports and chutes leading to counting-out pens require particular attention. This scrubbing should include the wool table, catching and holding pens, doors and catches of catching pens, broom handles, and handles on the machine-starting cords. The efficacy of scrubbing will be greatly increased by the use of hot water in which is dissolved a grease- and dirt-removing chemical, the best being washing soda (1lb. to 1 gallon) or one of the modern detergents. Detergents which have come on to the market in recent years are most efficient and are ideally suited for this purpose and for cleaning handpieces. Scrubbing is most easily carried out with a long-handled stiff broom.

The parts of the shed mentioned, including the walls, should then be sprayed thoroughly with a solution of disinfectant in water. Carbolic acid or a similar approved and reliable disinfectant of this type is suitable. A knapsack or stirrup-pump sprayer is useful for this purpose.

This disinfectant spraying of parts of the shed and counting-out pens is desirable after each day's shearing.

Cleaning the Handpieces

The cleaning and disinfection of handpieces are among the most important and difficult problems in shearing hygiene. Handpieces are very likely to become infected—for instance, by pus from a caseous lymphadenitis abscess—and are most likely to implant this infection in a cut in another sheep.

Boiling for 2 minutes is by far the most efficient means of disinfecting handpieces, but the practical difficulties are very great. In most circumstances the next best method must be used. First, all grease, dried pus, blood, and other dirt should be removed, which is best done by soaking the handpieces in a hot solution of caustic soda (1oz. to 2½ pints of water) or one of the modern detergent disinfectants. They should next be soaked thoroughly in a strong solution of carbolic acid or similar approved disinfectant. The process is completed by rinsing them in water and drying and oiling them.

Threading combs and cutters on a piece of wire enables them to be soaked easily. The hotter is the solution the better will be its effect. This process will not diminish the life or efficiency of the parts.

Handpieces should be disinfected and cleaned before each day's shearing. A handpiece which becomes fouled by pus during shearing should be cleaned similarly before it is used on the next sheep. For this purpose small containers of caustic soda or detergent, disinfectant, and water, a drying cloth, and an oilcan should be kept ready for use on a ledge handy to the shearing board; shearers are then much more likely to use them. The containers should be cleaned out and the solutions renewed after each day's shearing.

Blade shears should be treated in the same way as handpieces.

Treatment of Shearing Wounds

Treatment of all small cuts obviously is impracticable, but any large or major wounds should receive attention.

Counting-out pens require particular attention and should be scrubbed with a detergent or washing soda solution and then sprayed with disinfectant.

Not only has the time-honoured method of applying tar with a sacking swab on the end of a stick serious disadvantages hygienically, but it is illegal. The disinfectant value of tar is very slight, the application of tar to wool detracts from its value, and repeated use of a swab is likely to spread infection.

Much better is the application of a disinfectant solution from a clean and previously boiled oilcan, one of which should be kept handy to each shearing stand. A suitable solution is 1 to 2 parts of phenol in 100 parts of water. Other reliable disinfectants may be used in similar weak concentrations according to makers' directions. This treatment should be carried out immediately a wound is inflicted or, if it is overlooked, in the counting-out pen.

On valuable stud sheep the use of penicillin cerate on wounds is desirable, the most potent (100,000-unit) tube used for mastitis in cows being suitable. Sulphanilamide powder in a pepper tin with a perforated lid provides another useful method of treating severe cuts. The use of sulphanilamide or penicillin is the best method when the value of the sheep warrants it. Very strong or irritant disinfectant solutions must not be used, as they cause tissue damage and retard healing.

In districts where fly strike is a problem the use of fly repellants round wounds is recommended. Pure benzine hexachloride dipping material in a solution 10 times normal dipping strength is effective.

Management of Sheep

Driving of sheep hard immediately before they are shorn and crowding of overheated, exhausted sheep into holding pens in the shed should be avoided. The aim is to hold the sheep about the shed and yards for the shortest possible time.

During shearing it is particularly important that counting-out pens be cleared as frequently as possible and freshly shorn sheep returned to clean paddocks with the least possible delay. This reduces the risk of infection considerably.

The youngest sheep should be shorn first and sheep known to have abscesses last. These measures help to limit the spread of caseous lymphadenitis.

Dagging before shearing is conducive to good shed hygiene.

Provision of feed and shelter for freshly shorn sheep is most important when a sudden change to cold temperatures occurs during shearing. Hay, chaff, and sometimes concentrate feeds are of considerable value in preventing losses of sheep in these circumstances. Animals suffering from extreme exposure and cold may with advantage be drenched with molasses, glucose, or a similar drench.

Old, dirty sheep camps under trees and beside hedges are frequently a hotbed of infection for blackleg, blood poisoning, and similar diseases. Whenever possible freshly shorn sheep should be kept from such places, but during storms this risk may have to be taken, as storm losses are likely to be more severe than those from disease.

Treatment of Transit Tetany

During shearing when mobs are driven a considerable distance and held for a period in the shed and yards with little feed or water a disease known as transit tetany or hypocalcaemia may develop. In the early stages affected animals separate from the mob, are unsteady and dopy, and move with a stilted gait. In the later stages they go down and may show convulsions and partial loss of consciousness. Death may occur within 12 to 24 hours.

In this condition, as in milk fever in ewes after lambing and in cows after calving, the level of calcium in the blood is lowered. Treatment by injection of calcium borogluconate results in a rapid cure—within 20 to 30 minutes. Between ¼ and ½oz. (about a tablespoonful) of calcium borogluconate is dissolved in 3 to 4oz. of boiling water, allowed to cool to blood heat, and injected under the skin with a hypodermic syringe and needle previously sterilised by being boiled for 5 minutes and kept under sterile conditions until it is used. The injection site should preferably be cleansed with a clean cottonwool swab soaked in methylated spirit.

Though the symptoms of sleepy sickness (twin lamb disease or pregnancy toxaemia) are similar, the disease is not cured by injection of calcium borogluconate.

Ewes heavy in lamb are most susceptible to transit tetany, but it may also occur in dry sheep. On properties where pre-lambing shearing is carried out particular care is needed to avoid management likely to cause transit tetany. Sheep must not be overdriven during mustering. They should be in the yards and shed for the shortest time possible and must be returned to clean paddocks with good feed as soon as possible. If their stay in the yards and shed is prolonged, ample feed must be provided.

A wise precaution is to have some weighed doses of calcium borogluconate powder and a syringe ready for use if required. They will also be of use if milk fever occurs in newly lambed ewes, for which the same treatment is required.

Prevention of Blackleg

The germ causing blackleg may arise through shearing wounds. The symptoms are relatively quick death and a black area in the muscles, usually near the wound.

An effective vaccine is available to prevent blackleg and, should the disease be suspected, the nearest Veterinarian or Inspector of Stock should be consulted to confirm the diagnosis and advise on vaccination procedure. The most recently dead sheep should be presented for diagnosis.

Shelter for Shorn Sheep

If sheep are shorn before they lamb, provision of ample feed and shelter for newly shorn sheep greatly reduces the risk of loss from stormy weather. In the absence of feed and shelter this risk is considerable. Effective shelters have been built on some properties with little natural shelter.

Lamb-marking Precautions

Considerable diversity of opinion exists among farmers about the most satisfactory method of castrating and docking lambs. There is controversy in particular over the merits of the use of rubber rings as opposed to those of other methods. On some properties an increase of tetanus has been apparent when rubber rings have been used on the tails.

When used carefully a knife is satisfactory for docking and castration. A number of useful instruments embodying a knife and a device for drawing out the testicles are on the market. Clean cuts with sharp instruments damage a minimum of tissue and thus minimise risk of infection.

Lamb marking is best carried out in a temporary enclosure in a clean, well-grassed paddock, as dusty permanent yards carry risk of infection. If necessary, temporary yards should be watered to lay the dust.

Knives and other instruments to be used for the operation should be sterilised by being boiled for 2 to 3 minutes after being thoroughly cleaned. A small tin filled with a solution of carbolic acid or a similar approved disinfectant and fixed to a post is suitable for holding the instruments during the operation. The disinfectant solution must not be allowed to become fouled, but should be renewed as necessary. A cloth kept in the disinfectant is useful for wiping the knife. Both cloth and tin should be thoroughly cleaned and boiled before the work is begun. If large numbers of lambs are marked, the knife requires reboiling at the lunch break and before work is begun the next day.

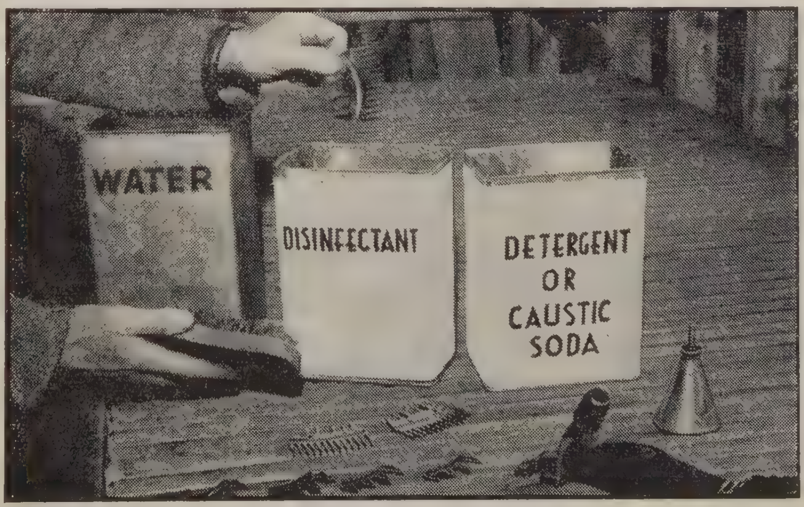
A bucket of water, nail brush, and soap should be kept handy so that the operator can scrub his hands thoroughly before starting and at intervals during the work.

A person who has recently skinned or plucked dead sheep should not mark lambs if it can be avoided, because the hands cannot be cleaned satisfactorily in the field.

Lambing Ewes

Ewes assisted at lambing are highly susceptible to infection and a high standard of hygiene is necessary. The person who assists lambing ewes should not handle dead sheep during or before lambing if it can be avoided. Paddocks known to carry infection are best not used for lambing ewes.

The facilities which can be carried on inspection rounds of lambing paddocks depend largely on the type of country. On flat country where a jogger (or sulky) is used a good supply of water can be carried and a high standard of hygiene maintained. Under these conditions the lambing kit recommended is: A can of water, a bucket, soap, nail brush, towel, disinfectant, clean cloths, liquid paraffin or olive oil, a coil of clean cord, a funnel and rubber tube, and a sterilised pocket knife. When lambing inspection is carried out on horseback essentially the same kit can be carried in the saddle bag, bottles of water replacing the can and a small enamel basin replacing the bucket.



Combs and cutters of handpieces should be cleaned in a detergent or caustic soda solution, then soaked in disinfectant, and finally rinsed in water before being oiled.

Leaving dead sheep to rot on paddocks and such places as turnip breaks results in the ground becoming contaminated with disease-producing bacteria.

The procedure is: Wash the external parts of the ewe, using water with a little disinfectant. Thoroughly scrub the hands and arms in a disinfectant solution and lubricate them with liquid paraffin or olive oil; some people advocate a few drops of disinfectant in the oil for this purpose. Lengths of cord used to assist delivery should be clean and soaked in disinfectant; if cords become soiled, they should be discarded and fresh ones used for the next ewe. If the natural fluids surrounding the lamb have been lost, they should be replaced by paraffin or oil through the funnel and tube. The tube must be thoroughly cleaned after use and boiled each day. The use of lubricant in this way and also on the hands and arms greatly aids delivery, minimises damage to the ewe, and reduces risk of infection.

Dipping Precautions

Maintenance of a high standard of cleanliness and care in dipping does much to prevent losses.

The dip should be thoroughly cleaned out before being used. If it is left empty for a period, sunlight and fresh air help to reduce bacterial contamination.

Removal of any object about the dip which is jagged or likely to cause skin wounds is important; corrugated iron about the entrance to or exit from the dip is an example. Sheep carry a considerable weight of fluid when leaving the dip, so the exit should not be too steep and be free from sharp concrete edges likely to break the skin.

Care must be taken to follow accurately the maker's instructions for mixing the dip. Inaccuracy may lead to poor destruction of the sheep ked (tick or louse) if the mixture is too weak or death of sheep if too strong a poisonous dip is used. The capacity of the dip must be known accurately, as guessing it leads to inefficient or dangerous dipping. Thorough mixing of the dipping material is essential.

Sheep should not be overcrowded in the draining pens and should be allowed sufficient time to drain adequately. Dipping must be started early in the day and finished in time for sheep to dry before nightfall. Driving sheep hard or very far immediately before or after they have been dipped should be avoided.

Dipping in cold or wet weather is obviously risky, as is rough handling of sheep about the yards or dip. Efficient and safe dipping cannot be carried out in a hurry or without considerable care.

Disposal of Carcasses

Leaving carcasses and parts on the paddocks to rot results in spread of disease. For instance, if the carcass of a sheep which has died of blackleg or tetanus is left on the paddock, large numbers of the germs of the disease will reach the ground to attack other animals.

A satisfactory method of destroying sheep carcasses properly is in a large incinerator made from an old galvanised-iron tank or similar object. On flat country this may be mounted on wheels and shifted about the farm as required. Old oil hastens the burning. The construction of an efficient type of burning pit was described on page 208 of the September issue of the "Journal".

Rotting tails and testicles of lambs docked or castrated with rubber rings are also likely to infect the ground in paddocks where they fall. When other methods of docking and castration are used the tails and testicles should be disposed of hygienically.

Summary of Recommendations

Some of the methods suggested for achieving a high standard of hygiene may not always be practicable on every sheep farm, but such a standard should always be aimed at. An understanding of the risks involved should enable measures suitable to any property to be devised. The main points may be summarised as follows:—

Shearing

Prepare yards, shed, and equipment in plenty of time.

Concrete yards are ideal; in other types dust may be laid by watering.

Counting-out pens should always be concreted and must be kept scrupulously clean; spray them frequently with disinfectant.

Do not use the shearing shed for purposes likely to contaminate it; for example, for storing carcasses, dead wool, or sheepskins.

Sweep all dust and litter from the shed and burn or bury it; remove grease and dirt.

Scrub the parts of the shed used for sheep with hot water containing washing soda or a detergent; spray them with disinfectant.

Before each day's shearing clean handpieces with a detergent or caustic soda solution and a disinfectant solution, then rinse, dry, and oil them.

Keep clean cloths and small tins of detergent or caustic soda solution, disinfectant, and water in a handy position on the board for cleaning handpieces contaminated by pus during shearing.

Do not use tar for dressing wounds. Apply disinfectant solution from an oilcan to severe wounds; if the value of the sheep warrants it, use penicillin cerate or sulphanilamide powder.

Shear last sheep most likely to contaminate handpieces and shed.

Keep sheep about the shed and yards for the shortest possible time.

Feed and shelter are valuable for shorn sheep in stormy weather, particularly if sheep are shorn before they lamb.

Overcrowding and a period without feed may cause transit tetany, particularly in ewes in lamb; calcium borogluconate injections give a rapid cure.

Vaccination is effective to prevent blackleg, which may result from infection of shearing wounds.

Lamb Marking

Mark lambs in temporary yards in a well-grassed, clean paddock.

Instruments used can be sterilised efficiently only by being boiled for 2 to 3 minutes; during the operation keep them in a tin of disinfectant.

On some properties tail docking by rubber rings has resulted in an increase of disease.

A knife is satisfactory for docking and castration if it is used carefully.

Lambing

Avoid plucking or skinning dead sheep before or during lambing if possible.

Carry facilities for cleaning and lubrication and for assisting delivery.

Lubrication of the operator's hands and arms and of the ewe where necessary lessens injury to the ewe and risk of infection.

Do not wash out ewes with strong disinfectant.

Dipping

Thoroughly clean out the dip and remove any objects likely to damage the sheeps' skins.

Mix the dip material accurately according to instructions.

Start and finish dipping early in the day.

Avoid overheating, fatigue, and thirst in the sheep before and after dipping.

All photographs by Campbell Photography.

Checking Efficiency of Milking Machines: Survey to be Extended

By W. G. BATT, Supervisor of Farm Dairy Instruction, Dairy Division, Department of Agriculture, Hamilton, and D. S. M. PHILLIPS, Physicist, Department of Agriculture Animal Research Station, Ruakura

OVER the past few years Ruakura workers have been developing methods of testing milking equipment and building up standards for milking machine performance which could be used to provide an efficient system for servicing machines in the industry. Officers of the Dairy Division have been interested in trying out these techniques in the field with a view to developing a practical testing service which might be used throughout New Zealand. The basis of the methods and standards used and the progress made in a preliminary attempt to provide such a service to a group of 100 farmers are discussed in this article.

THE January issue of the "Journal" contained an article describing the main features of an attempt to make some constructive use of milking machine standards and testing equipment developed at Ruakura. Two Farm Dairy Instructors of the Dairy Division were trained in the use of the equipment necessary and thereafter examined 100 machines in the Te Awamutu and Thames districts. The article set out the more important findings revealed by the instruments and listed the percentage of faults in the working parts of the machines.

Subsequent to this first check recommendations which it was believed would correct the faults noted were made in each case. Though farmers were under no obligation to carry out the suggested improvements, and though the season was too far advanced to expect 100 per cent. response, it was expected that a reasonable proportion would have done so by the time a second check was completed by March 31 last. Data were thus obtained on improvement in mechanical efficiency of machines which were altered in accordance with the results of the first survey.

Basis of Methods and Standards

Since the ultimate objective of the investigations is the development and organisation of a milking machine testing service that is both efficient and impartial, so that farmers can proceed with improvements and maintenance with confidence, it is important to appreciate that any such service can be only as efficient as the research that has preceded it. The basis of a servicing system is the development of accurate standards, testing methods, and testing equipment. Ruakura research has been directed toward these ends. However, the very detailed and refined methods possible on an experimental scale have to be simplified and reduced to a minimum before a practical system capable of being used by non-experts and under all milking shed conditions can eventuate. In part, therefore, the present attempt represents a trial both of relatively simple methods and equipment, which may have to undergo modification before a really satisfactory testing service can be evolved.

Apart from routine examination of relief valves, pulsators, and vacuum gauges it was decided to concentrate on the measurement of air consumption, pump capacity, and reserve air as the most significant indications of machine efficiency. Defects in the efficiency of the vacuum system have been found to be the fundamental cause of inefficiency in a big proportion of milking machines. A simple air-flow meter was designed capable of measuring air consumption, pump capacity, and reserve air. Standards covering air requirements in each of these categories were obtained from experimental work and were used to assess the efficiency of each machine. Valuable additional information on the stability of action of the machine would have been obtained if a vacuum recorder of a simple type had been available. Such a recorder has now been designed at Ruakura and will be incorporated into future try-outs of testing schemes. The apparatus will make possible the measurement of efficiency of bail pulsators and releasers.

A testing service on the basis described cannot be expected to result in very much more than improved mechanical efficiency of the machine as a milking unit. Sufficient publicity has been given in the "Journal" to the results of Ruakura and other researches into milking methods to support the conclusion that efficient machine milking of dairy cows involves harmonious and intelligent co-operation of the three members of the milking team: The machine, the man, and the cow. The testing service can be expected to improve the suitability of the machine as a mechanical unit; it may even be expected to improve the relationships between the machine and the cow to some degree; but it cannot be expected to alter the basic milking behaviour of the cow or the milking methods of the farmer. Accordingly, spectacular improvement in milking should not be expected from any testing service. In fact, claims to this effect should be distrusted.

Extension of Survey

AN additional 10 districts in the main dairying areas throughout the Dominion will be included in the milking machine survey during the current season, the Director of the Dairy Division, Department of Agriculture, announces. The survey work will be an extension of the Farm Dairy Instruction service, but will not involve an increase in staff at this stage and the work will be controlled and administered similarly to the trial survey described. It is hoped that arrangements can be completed for the checking to begin in the next autumn, but this depends on the training of staff and the construction of testing instruments.

The extended service will be under the control of the Supervisor of Farm Dairy Instruction, who is in close contact with research at Ruakura Animal Research Station and with the scientific workers in this field.

Because of the nature of the machine-cow partnership, improvements in milking through changes in the machine alone should not be expected for some weeks. By this time correct adjustment of cows to the more stable action of the serviced machine will have occurred and the cows will have settled down to their best milking behaviour. This adjustment of cow to machine cannot occur with machines that are so unstable that they seldom offer constant conditions to the cows being milked. Attainment of stability of these conditions must be the primary aim in a sound testing service.

Response of Farmers

No alterations to machines were recommended on 22 of the 100 farms covered by this trial service. On the remaining 78 farms the position at the present stage is as follows:—

	Per cent.
Machines altered as recommended	52.5
Machines likely to be altered ..	23.0
Machines unlikely to be altered	21.5
Properties sold	3.0

In this summary the data for the two districts have been combined, since no material difference existed between them. That only 41 machines of the 78 requiring alteration were improved in accordance with the recommendations may at first appear disappointing. However, the majority of the units were inspected when the farmers were engaged in production and it is thought that this had a bearing on the number of machines altered by March 31, which was set as an arbitrary limit for the conclusion of the re-check visits. It should be emphasised also that the service was not requested by the individual farmers concerned, so that the fact that one in five of these apparently does not propose to effect any improvement must not be considered unreasonable.

Re-checking of the altered machines showed that in all but 5 of the 41 concerned the improvements made as a result of the first tests brought the machines up to the required standards in air consumption, pump capacity, and reserve air. In 5 cases further attention was indicated as necessary.

Though a warning was given earlier in this article about the difficulty of interpreting field results in so far as they relate to claims to improved milking efficiency, it is of interest that the farmers whose machines were

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improved have all expressed satisfaction with the results and reported better milking performance. The majority believed that cows milked faster and cleaner.

Conclusions

This trial service has provided additional data to show that a high proportion of machines in use are mechanically and operatively inefficient. Previous researches have provided substantially the same picture both as to the nature of faults and their extent. It is reasonable to conclude therefore that the development of an efficient testing service of the type described is urgently required.

The proportion of farmers who have been sufficiently interested to act on the advice given has been encouraging, so that it might be argued that a large-scale service would produce action on a worthwhile scale.

Experience in the field with the airflow meter has shown that this can be made so that it measures up to the many requirements involved under practical conditions. Comparable success seems likely from preliminary tests of a vacuum recorder, so that an increase in the efficiency of a testing service may be expected.

The trial has stimulated widespread inquiry and interest. The main object in publishing these early results has been to satisfy this interest and to point out that no technical bar exists to the development of testing services, even in the form of the present one, on a national scale.

Radio Broadcasts

THE following radio broadcasts will be given from Station 3YA Christchurch:—

December 3 (at 12.20 p.m.)—"Grass-grub and Subterranean Caterpillar Control", by J. M. Kelsey, Entomological Research Station, Department of Scientific and Industrial Research.

December 20 (at 7.15 p.m.)—"Some Aspects of Bulb Growing", by M. R. Porter, Assistant Orchard Instructor, Department of Agriculture, Christchurch.

The following broadcast will be given from Station 4YZ Invercargill at 7.15 p.m.:—

December 17—"Blind Seed Disease in Ryegrass", by A. V. Lithgow, Officer in Charge, Department of Agriculture Seed-testing Station, Palmerston North.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 1YD Auckland on Thursdays at 7.30 p.m., 1XN Whangarei on Mondays and Wednesdays at 8.10 p.m., 1ZH Hamilton on Mondays at 8.45 p.m., 2YZ Napier on Tuesdays at 7.10 p.m., 2YA Wellington on Thursdays at 12.35 p.m., 2XN Nelson on Thursdays at 8 p.m., 3YA Christchurch on Mondays at 12.20 p.m., 4YA Dunedin on Thursdays at 12.35 p.m., and 4YZ Invercargill on Mondays at 12.35 p.m.

Necessity for Additional Meat-export Slaughterhouse in Southland

THE conclusion that a new works in Southland is not only justified, but is also a necessity, was reached by the Royal Commission appointed to inquire into and report upon the desirability of establishing an additional meat-export slaughterhouse in Southland. Copies of the report, which was tabled recently in the House of Representatives, are available at 1s. each from Publications Section, Department of Agriculture, Box 2298, Wellington.

Sampling Ryegrass Crops for Blind Seed Examination

PRE-HARVEST examination of ryegrass for blind seed disease has been undertaken for some years by the Seed-testing Station, Palmerston North. Farmers and merchants have welcomed this service, which has necessitated the operation of one or more substations in the South Island. The service has enabled seed growers to avoid a financial loss and waste of time in harvesting crops which can yield only low-germinating seed and it has often supplied information that has caused them to cut later for white clover seed rather than earlier for ryegrass.

THE reports issued by the substations indicate the proportion of the sample affected by the disease, the stage of development of the seed, and any other information that may be of use to the grower. If this information is to have any real bearing on the crop from which the sample was drawn, the sample itself must have been carefully taken. It is a long job to sample correctly, but only by doing so can worthwhile results be obtained.

Last year at a conservative estimate 20 per cent. of the results issued could have been misleading, because that proportion of samples submitted for examination showed evidence of haphazard sampling. The most common faults apparent were:—

1. Some of the samples were half goosegrass and comprised handfuls of roots and pieces of grass.

2. Some samples were too small for proper examination and in extreme cases contained only five or six seed heads.

3. Some samples contained no means of identifying the sender; others had a grubby piece of newsprint bearing illegible lettering tucked beneath the stalks.

4. Many samples arrived unwrapped, while in some cases two or three samples were wrapped together, and where the seed had been shed it was hopelessly mixed.

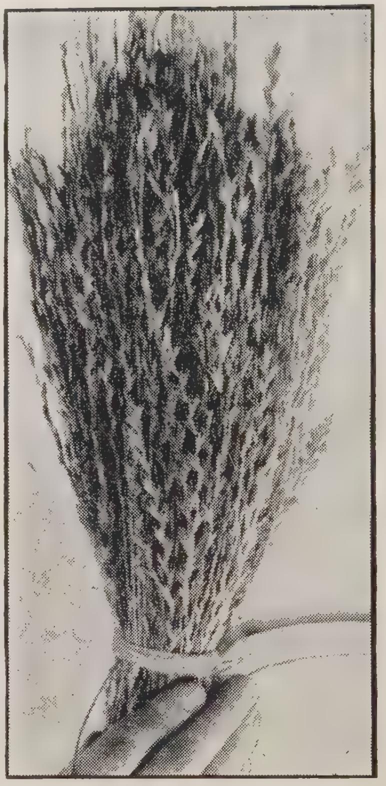
5. Some samples were still at the flowering stage and were quite unsuitable for examination.

If the following instructions are followed, the sample taken from the area should be as representative as it is possible for it to be:—

1. The sample should be taken when the crop is considered to be within a week of being ready to harvest, as reports on more immature samples are not so reliable.

2. If wet weather follows after the sample has been drawn, and particularly if harvesting is thus delayed, a further sample should be submitted. This is most important when the first sample shows some infection, as wet weather may cause a further spread.

3. The seed heads comprising the sample should be drawn from various places covering the whole area of the crop. This is best done by walking to and fro across the area and picking one seed head every 5 to 10 paces.



Blind seed disease.

The crossing of the area should be made at 5 to 10yd. intervals, depending on the size of the area being sampled.

The aim should be to collect 400 to 500 seed heads drawn individually at more or less regular intervals over the crop.

The sample should be trimmed to about 10in. in length and labelled in block letters with the sender's name, address, and telephone number. The date of sampling and the registered number of the area under certification (if applicable) should also be given. The sample should be wrapped and tied in several thicknesses of paper and dispatched **immediately**. North Island samples should be dispatched to the Seed-testing Station, Box 609, Palmerston North, and those in the South Island to the Department of Agriculture, Box 110, Timaru. Alternatively if the grower is in the North Canterbury area, the sample, for convenience, may be forwarded to the Department of Agriculture, Private Bag, Christchurch, endorsed "Blind Seed Examination", when the Department will arrange to forward it to Timaru. If the sample is not forwarded to the Department immediately it has been collected, it will dry out and become difficult to examine, while promptness of dispatch will also ensure earlier notification of the result.

Grassland Association Conference in Taranaki

SUBJECTS of special application to farming in Taranaki were discussed at the 13th annual conference of the New Zealand Grassland Association held in New Plymouth over 3 days toward the end of October; but there were other papers of general agricultural interest for that portion of the nearly 500 delegates that came from far afield in both islands. Research and extension workers in agriculture, farmers, stock and station agents, fertiliser and implement manufacturers, and agricultural journalists were present.

Mr. E. Bruce Levy, president of the Grassland Conference, addressing delegates on the pastures of a town-supply dairy farm at Lepperton.

THERE were some subjects, particularly the development of marginal hill country and the incidence and control of bloat, on which more discussion was offering than the time allowed would permit. As at previous conferences, there was a tendency for speakers to encroach on discussion time with their papers, and the desirability of shorter papers and more debate was freely expressed.

Hill-country Development

Cancellation because of bad weather of a visit to a hill-county property at Uruti enabled extended discussion in a substitute programme of the development of marginal hill country and its finance, which produced two schools of thought, one advocating State assistance and the other claiming that the work could be managed by the industry itself. After full and frank discussion of several papers on the subject the suggestion that the association's sphere was in the grassland development of such country and not in the machinery of its implementation, for which there were adequate proponents, was accepted.

Management of Dairy Pastures

A field day at a 115-acre dairy farm at Lepperton producing milk for town supply enabled study of typical Taranaki dairy pastures and discussion on the spot and subsequently of composition of milk-producing pastures and their management, particularly with the electric fence, adoption of which for grazing management is widespread.

With their appreciative acceptance of high-producing strains of pasture constituents, the availability of whose peak of nutrition was spread over an ever-extending period, farmers had also accepted responsibilities and problems in the correct management of the new swards. Rotational grazing; break feeding; abandonment of the night paddock or apportionment of paddocks to stock in conformity with the rates of day and night grazing; maintainance of an even return of fertility through the animal to all paddocks on the farm; the use on dairy farms of a central stock race giving easy access to all paddocks; these, though widely accepted and practised by farmers for the achievement of higher production and increased fertility of their land, are subjects on which they had many questions for the research and extension workers who gave pertinent papers. The need for the farmer to grow at least one supplementary feed crop annually to tide over the period when pastures are at their lowest point of production, though strongly advocated as a theory, seems to fall short in acceptance as practice.

Renewal of Pastures

Indicative of increasing awareness of the need to renew pastures, which should entail the taking of a crop from the paddock cultivated, were figures quoted by the Department of Agriculture's instructor in the district. Before the war machinery firms sold one plough per dozen tractors; now the proportions were one plough to every 2 or 3 tractors. More grass had been renewed in the last 5 or 6 years than in any other period in the district's history.

Drainage

There was considerable interest in drainage, which it was agreed would benefit much land in Taranaki, where costs of tiles are somewhat high and where the climate might limit the use of some types of heavy machinery. The subject was appropriately discussed when rain thundering on the iron roof of the conference hall necessitated questioners using the microphone to make themselves heard. On land needing it drainage could be conservatively estimated to raise production by the equivalent of ¼ cow per acre, which would leave a small but appreciable profit over the costs of meeting a loan over a 25-year period.

Farmers' Tribute to Mr. Levy

Mr. G. Stevenson, Southland, and Mr. R. A. Candy, Waikato, in paying a tribute on behalf of farmers to the conference president, Mr. E. Bruce Levy, for his 40 years' service to the farming industry through his grassland research, said that after his retirement at the end of this year many farmers would continue to implement the principles he had propounded personally and through the Grassland Association. The conference also made Mr. Levy its second life member, the other being Mr. A. H. Cockayne, late Director-General of Agriculture and a former president of the association, under whom Mr. Levy began his early work on grassland research.

Young Farmers' Interest

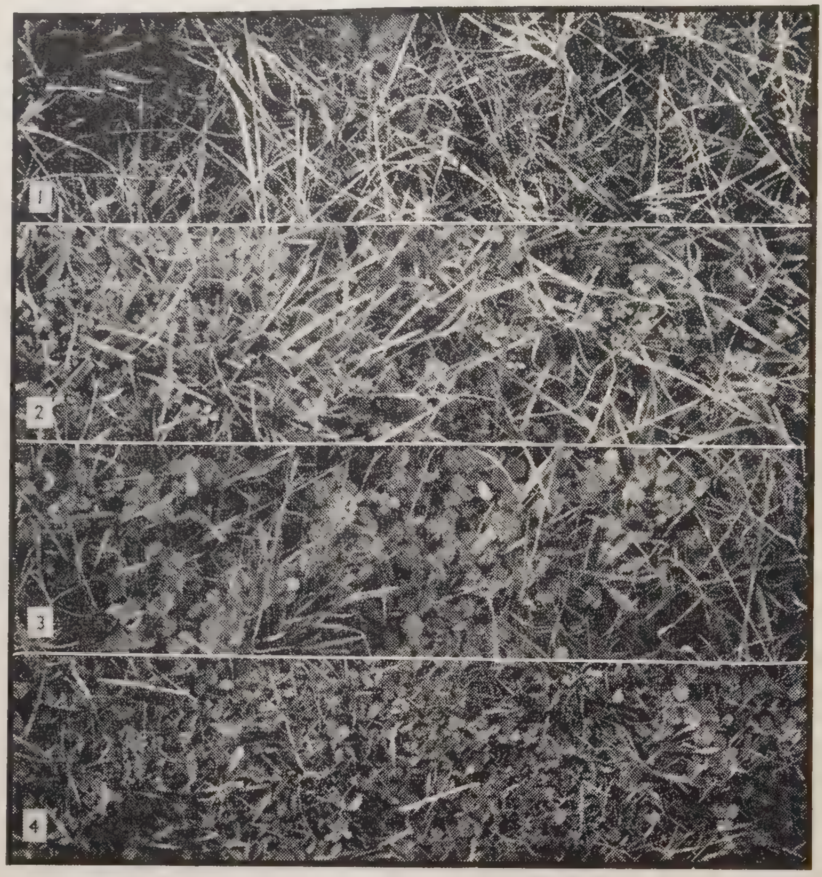
A feature of the conference was the large attendance of young farmers and the constructive part they took in discussion. The incoming executive was recommended to endeavour to ensure continuing membership of young farmers through the official Y.F.C. Federation and to try to retain the membership of many farmers who at present joined only when the conference was held in their district. This year the membership was 492.

Future Conferences

Mr. R. H. Bevin, Christchurch, will be president of the association's conference to be held next year in Timaru toward the end of November, and the newly elected vice president, Professor A. W. Hudson, will automatically be president for the 1953 conference, which is to be held in Whangarei toward the end of October. Mr. S. H. Saxby was re-elected secretary and the executive committee comprises Messrs. Bevin, Hudson, Levy, Saxby, C. C. Leitch, Christchurch, and C. E. Iversen, Christchurch.—*G.J.N.*

Tallarook Subterranean Clover: Establishment on Hard Hill Faces

THE establishment of clovers on hard faces in hill country, particularly under exposed conditions, has always been a problem to hill-country farmers. This article by L. W. Woods, Assistant Rural Economist, Department of Agriculture, Wellington, details some experiences with the Tallarook strain of subterranean clover in such circumstances.



1. Typical pasture of the soil type in unimproved condition. Poor, open danthonia-browntop sward with a trace of annual clovers. It contains hypericum, manuka, catsear, and *Geranium sessiliflorum*. 2. Response of the typical pasture to lime and superphosphate. Suckling clover and clustered clover are coming into the danthonia sward as the result of topdressing. 3. Typical growth and establishment of Tallarook, spreading out in a compact patch where a plant has been the previous year. 4. Close-set carpet cover of Tallarook 13 months from first oversowing at 5lb. per acre.

DURING a recent survey of hill-country farming in Akitio County two trends in oversowing practices were observed on lighter, dry lands. The numerous plot trials laid down by the Department of Agriculture and by the Department of Scientific and Industrial Research over a period of years showed that of the subterranean clover species oversown distinct differences in establishment were discerned between the Mt. Barker and Tallarook strains. These strains have always been noted for differing growth characteristics, Mt. Barker being on the whole a month earlier in growth than Tallarook, Tallarook consequently lasting a little longer in late spring before drying off. On the lighter lands of the Hawkes Bay-Wairarapa coast it has become a fairly common practice to oversow both varieties together.

Establishment on Hard Faces

In the Akitio County area it was noted from the plot trials that on really hard faces lying fully to the sun where there were numerous bare patches and much moss the Tallarook strain gave a much more complete or carpet cover of the soil and established to that stage in generally shorter periods than Mt. Barker strain. Although this trend was nowhere very pronounced, it occurred in all the comparative trials under such conditions.

Heavier Rates of Oversowing

The habit of Tallarook of giving a close carpet cover on hard, sunny faces was the first trend observed. The second trend seen was the increasing habit of farmers who have topdressed and oversown for a long period to oversow with a heavier weight of seed than formerly, 6 to 7lb. per acre being now a common practice. In their opinion, this heavier oversowing gave them a much quicker response, a greater clover population in the pasture to take advantage of continued topdressing, and consequently an earlier increase in carrying capacity or improvement in stock condition resulting in greater production with increased revenue to finance the necessary continued annual topdressings.

Trial in Hard Conditions

On one of the farms of Akitio County where the Department of Agriculture is now laying down an extensive co-operative farm experiment, Mr. W. Leach, Pongaroa, decided to combine these two trends and apply them to a hard, manuka-infested face lying to full sun and wind on his Akaroa Road farm. The scattered manuka was cut, but as there was not sufficient of it, it was impossible to get a satisfactory burn. The face, which is on a 45-degree angle, is steep, with numerous slips and bare patches, particularly below hardened sheep tracks. The soil is a moderately fertile silt loam formed over mudstone and has a compacting clay subsoil. In exposed places this subsoil clay dries very hard. Existing pasture consisted of danthonia and moss with some browntop, dogstail, hairgrass, helichrysum, flat weeds, and traces of suckling clover.

Topdressed and Oversown

Mr. Leach topdressed this face in autumn, 1950, with 1 ton of lime and 2cwt. of superphosphate, and oversowed it in March, 1950, with Certified Tallarook subterranean clover at the rate of 5lb. per acre. As it was hand sown without a spinner, there were some areas where no seed fell, but otherwise the strike appeared even. Spring and summer, 1950-51, were favourable to newly oversown areas, there being enough moisture for good strong growth without the excess experienced on other parts of the eastern coastal districts. The paddock has been rotationally grazed with as big a mob of sheep as Mr. Leach could muster on that part of the farm, but was spelled in late spring to give the clover a chance to reseed.

Illustrations Show Results

The accompanying illustrations are from photographs taken in April, 1951, 13 months after the initial oversowing. No further phosphate had been applied at that stage because of the late arrival of supplies intended for autumn topdressing, but the area has since been topdressed with a further 2cwt. of superphosphate compound. As a result of hand sowing as against the use of a hand-operated spinner, commonly called a whirligig, there are still some uneven patches, but there is remarkable cover generally over the face, Tallarook having formed a close-set carpet even among the moss and on the hard bare "cliffs" below sheep tracks and at the top of slips.

Controlling the Swarming of Bees

Seasonal Notes for the Domestic Beekeeper

IN those areas of the country where there has been a steady build-up in the brood nest and the population of hives has become strong there will be a tendency according to seasonal conditions for swarms to emerge up to the end of December. The experienced beekeeper knows by the crowded appearance of the bees, in conjunction with the warmth of the weather, when it is time to add extra supers, but there are a number of other ways in which he may contribute toward minimising swarming. These ways are discussed in this article by S. Line, Apiary Instructor, Department of Agriculture, Invercargill.

THE presence of a young queen in each hive is the ideal, for she is setting the pace for activity within the hive and the rest of the bees automatically are eager to do their part in its expansion as a single unit. This is not always so, for queens may be from a strain with a weakness for swarming. The beekeeper buying or breeding his own queens should select them from a type that is known not only to be good workers and reasonably gentle to handle, but that have not shown a tendency to raise queen cells.

It is not always possible to have a young queen in each hive, and to offset any tendency to swarm because of the presence of an old queen manipulation of the combs in the area of the brood nest is essential to prevent congestion. During spring a two-storey hive of average strength has the brood nest located more in the upper super. When the season has become sufficiently warm to obviate the likelihood of the brood being easily chilled the top super should be lifted at one end and a quick inspection made from underneath for any signs of queen cells. These will sometimes be seen suspended from the lower edges of the comb, which is one of the favourite places for cells to be produced. A quick movement with the hive tool will break away any queen cells being developed. It may be necessary to stand this super aside on the hive lid or roof and remove a few of the brood frames for a closer inspection.

Frequently the lower of the two supers will have fewer bees and a smaller brood area, and it is a general practice to reverse the position of the supers so that the upper super is placed on the floor board and the original lower one above.

Tilting up an upper super to examine the under sides of combs for queen cells.

Adding Extra Box of Combs

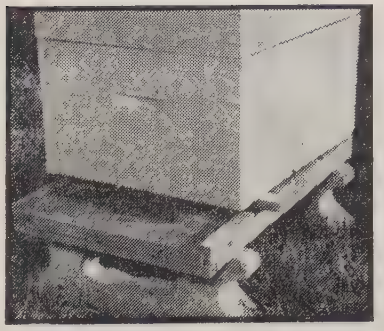
If the hive is so strong that both upper and lower supers are packed with bees, it will be time to add an extra box of combs into which the bees can expand. Congestion in the brood nest can be relieved by moving several combs containing honey and pollen up into the next super, spreading the brood below and inserting full-drawn combs in such a way that the queen will have added room to lay eggs but will not have her nest unduly chilled. The relieving of congestion before queen cells are formed is essential to prevent swarming. If some hives are persistently forming queen cells, it might be advisable to place foundation comb in the added supers and increase the ventilation at the bottom.

Using a division board to keep a spare queen or nucleus hive above a full-sized hive.

A queen excluder can be used in swarm control by lifting out each frame of brood and giving it a sharp downward jerk at the entrance of the hive to dislodge the bees and in particular the queen. These frames are then quickly placed in an empty super already provided, only about 2 frames of brood being left in the original brood nest. The gap on each side is then filled in with empty drawn comb of a type free of drone cells and preferably extending right to the bottom bar. The excluder is then placed above. The super of brood is now placed over the excluder and the hive closed up quickly. In hives treated in this way it is usually only the top super (above the excluder) that may have queen cells to be destroyed, and no inspection of the lower area will be needed for some time.

Ventilation of Hives

The ventilation of hives, especially in districts where sunlight is intense during the summer, will make conditions more comfortable for bees' working conditions. The fact that combs have melted with the heat of summer when iron roofs have been used with little insulating material underneath indicates that in very dry or stony localities a slight raising of the roof to give ventilation through the top is desirable. In most districts it is sufficient to give the maximum entrance on the bottom board and this can be increased when a colony is very strong in bees during hot weather by passing a ½in. batten between the bottom super and the front part of the bottom board as shown in the illustration above.



Use of a batten between super and bottom board to increase ventilation at the entrance of a hive in summer.

Hives should be examined about every 10 days during the warmer spring months, but as wet weather will at some time upset this arrangement, it is desirable to make provision ahead of requirements, either of food needs in early spring or of adequate room for expansion later.

Sometimes during inspection of the brood nest an occasional queen cell about to hatch is found. If it is desired to keep the new queen as a standby, nucleus boxes or hives are a convenient provision; but a better method is to keep on hand several division boards (horizontal wooden partitions the same size as the supers, 16in. x 20in.). The frame with the queen cell, 2 or 3 combs of hatching and adhering bees, and a comb of honey are then placed in an empty super and this is placed above the division board over a strong hive. This method utilises standard equipment and a minimum of "spare parts". The nucleus, being placed above the main body of the hive, absorbs some of the warmth from below and can develop more vigorously when the young queen hatches and becomes mated.

Before hives become heavy with honey the brood should be thoroughly examined to ensure that there is no foul-brood present. Any beekeeper who has not witnessed the appearance of brood containing foul-brood cells should mention it to his Apiary Instructor and an opportunity will be found to make him familiar with the symptoms. A close watch should be kept for the appearance of this disease, for it always comes as a surprise. Apart from some oversight in beekeeping practice such as feeding honey containing bacillus larvae to hives short of food, there is the danger of someone unfamiliar with bees leaving empty honey cartons uncovered or unburnt.

Photographs by Commercial Studios.

Care of Livestock during December

Contributed by the Animal Research Division

EWES AND FAT LAMBS

As each lot of lambs is sold draft off their mothers together with any dry ewes which may remain in the flock. If feed is short and the ewes have very little milk, it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained should be placed on short pasture with ample water. This will help to reduce their condition and will result in a better lamb percentage in the following season.

SHEARING

If ewes with lambs are to be shorn, every effort must be made to reduce the time during which lambs are away from the ewes, as it is easy to dry off ewes at this time of year. They should be brought to the shearing shed in small mobs and should be dagged before reaching the board.

FOOT-ROT CAN BE ERADICATED

Farmers who wish to eradicate foot-rot from their flocks should obtain the Department of Agriculture's Bulletin No. 325. This is the season in which the eradication campaign must be planned.

PIG FEEDING

Sows should be brought into the house a week or two before farrowing and fed up to 6 gallons of milk per day, but this should be reduced to 2 gallons plus bran, if available, on the due date. Watch for signs of constipation in heavy in-pig sows. Baconers from spring litters should be sold as sow feed requirements increase, as it is important not to starve the sows and litters. These sows require 6 gallons of milk plus an additional gallon for each pig in the litter. Meal may be used to replace part of this ration at the rate of 1lb. of meal for every gallon of milk. Orders for meal supplies for next spring should now be placed with the merchants.

COWS RETURNING TO THE BULL

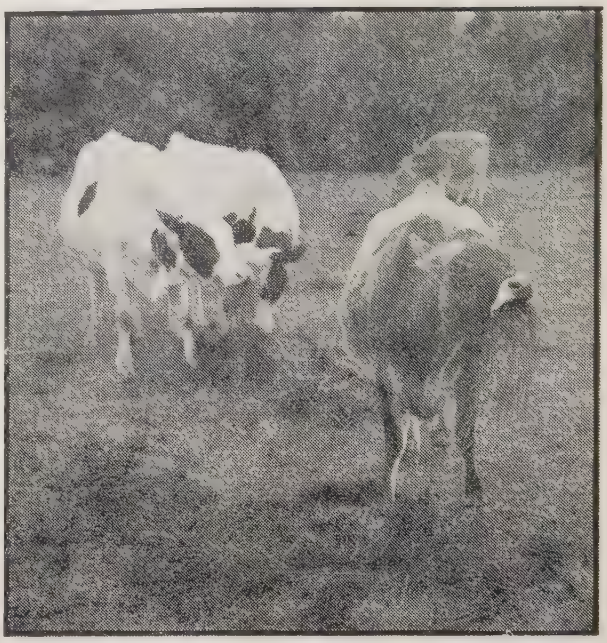
If cows are returning to service, examine the mating records to see if any particular bull is to blame. If this is so, get a Veterinarian or Inspector of Stock to collect a semen sample from it for examination. Be careful in purchasing replacement bulls. If possible, buy a young bull that has not been used previously. Never buy a bull in the saleyards unless his full history is known. Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It pays to consult a Veterinarian as soon as the cows are noticed returning to service in unusual numbers. He cannot be expected to diagnose the trouble months later.

FOWL POX

So-called roup is often fowl pox. Send specimens to the Department of Agriculture Animal Research Station, Wallaceville, for diagnosis. Outbreaks of this disease can be prevented by vaccination, of which full details may be obtained from the nearest Poultry Instructor.

ZINC POISONING IN PIGS

The zinc lining of new galvanised pipes may be dissolved by dairy by-products flowing through them. The by-products then prove poisonous when fed to pigs. The nearest Veterinarian should be consulted before making a new installation.



DAIRY COW NUTRITION

Dairy production for the year can be materially affected by feed conditions for the cows during summer. Cows fed poorly now not only produce less milk during summer, but also will dry off earlier in autumn. Dairy statistics show that a long lactation is very important, so start feeding silage or other supplementary milk-producing fodders as soon as pasture begins to dry off. Do not wait for milk production to show a material fall.

Dairy Produce Graded for Export

The following figures showing quantities of dairy produce graded for export during September and for the 2 months ended September 30, 1951, with comparative figures for the same month and 2-monthly period of 1950, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period		Tons		% inc. or dec.	Total tons in store at end of mth.
	Creamery	Whey	Total		
September, 1951 .	13,383	234	13,617	—	13,594
September, 1950 .	13,939	285	14,224	—	16,815
Inc. or dec. ..	—556	—51	—607	—4.267	—3,221
For 2 mths. to 30/9/51 ..	22,266	347	22,613	—	—
For 2 mths. to 30/9/50 ..	23,050	395	23,445	—	—
Inc. or dec. ..	—784	—48	—832	—3.548	—

CHEESE

Period		Tons		% inc. or dec.	Total tons in store at end of mth.
	White	Coloured	Total		
September, 1951 .	6,169	2	6,171	—	7,417
September, 1950 .	6,568	933	7,501	—	9,620
Inc. or dec. ..	—399	—931	—1,330	—17.730	—2,203
For 2 mths. to 30/9/51 ..	7,825	2	7,827	—	—
For 2 mths. to 30/9/50 ..	8,070	1,223	9,293	—	—
Inc. or dec. ..	—245	—1,221	—1,466	—15.775	—

If these figures are converted into butterfat equivalent, there is a decrease of 5.366 per cent. in butterfat graded for the 2 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Harvesting Cereals and Clover

Seasonal Notes by the Extension Division

HARVESTING machinery should be given a final check now so that it will be in good working order when it is needed in the harvest field. Care should be exercised to harvest a crop at the correct stage and to adjust a header harvester to work the crop satisfactorily.

* * *

WHEAT

TIGHT-CHAFFED varieties of wheat such as Cross 7 and Fife Tuscan are usually direct headed and may be left standing until they are dead ripe with little risk of shaking. Hunters, Dreadnought, and similar varieties should be either reaped and stooked or windrowed when binder ripe—that is, when the straw has turned colour, the knots still show some green, and the grain is firm. The moisture content of the grain should be below 15 per cent. Experienced growers will have no doubt about when threshing should be started, but the Wheat Research Institute gives a moisture-testing service, details of which are notified in local newspapers, that can be availed of should doubt arise. Farmers who wish to use this service should ensure that their samples are representative of the crops. Grain samples must be forwarded in air-tight containers.

OATS

Most of the oat crop is still cut with a binder and threshed either out of stook or from the stack, but header harvesters are being used increasingly, particularly to thresh crops from the windrow. Occasionally a crop is direct headed, but it must be dead ripe. Oats intended for chaff are best cut about a week earlier than the binder-ripe stage for a grain crop. A grower who cannot say at harvest time whether he will use his crop for grain or for chaff should allow the crop to ripen to the cutting stage for grain.

BARLEY

Though direct heading of barley is now fairly common, undoubtedly the best samples are usually obtained when the crop is either reaped and stooked or windrowed and later picked up with a header harvester. Cutting of most varieties may be delayed until the straw shows no greenness, the grain is hard, and the skin is wrinkled. Malting barley should contain not more than 2 per cent. of broken or skinned grain, so the utmost care in threshing is essential. As correct concave setting and drum speed will vary throughout the day, frequent examination of the sample is desirable, but in general the drum speed will be much slower than for wheat.

* * *

THRESHING OF CLOVER

MOST CLOVER CROPS are now threshed with header harvesters, so considerable care is necessary to minimise losses. Threshing too hard may cause broken, cracked, or chipped seed; incomplete threshing results in loss because of seed going out in the cavings. Investigations by officers of the Extension Division indicate that the condition of the swath at the time of harvesting is most important, for on this the setting of the header is based. If the swath is damp, the header drum is usually screwed down and speeded up to thresh out the seed, but seed damage results to the detriment of the sample. On the other hand, threshing in hot, dry, north-west conditions can also cause damage because of the seed being too brittle. Obviously, optimum condition lies between these two extremes.

CONDITION OF SWATH

The clover crop should contain a little (but only a little) ryegrass, so that when the swath is formed it has sufficient body to enable all the clover to be picked up with the header harvester. Judicious grazing just before the field is closed assists in controlling ryegrass. At mowing time the swath may need to be pulled in with two divider boards to give it sufficient body; if the growth is denser, one outside divider may suffice. The swath should have body and be even along its length, but not so dense as to impair drying out. If the weather is unfavourable after mowing, the swath may have to be undercut with a mower to free it from clover regrowth. The top of the swath usually dries out after rain, but the bottom often remains damp. In these circumstances attempting to head the crop is fatal, for the seed cannot be threshed efficiently under two sets of swath conditions with one header setting without damage to and loss of seed. The swath must be dry throughout its bulk. An aerator—a machine which lifts the swath gently and deposits it back on top of the stubble—enables the swath to dry out quickly and efficiently, and heading can often follow a few hours later. Loss of seed caused by germination in a damp swath is reduced markedly with this machine, which proved its worth during Canterbury's wet harvest last season.

HEADER SETTINGS

Clover seed can be easily damaged by the header harvester if the swath is not in the correct condition, but provided the swath is fit, little damage occurs within the normal range of header settings that are used. The drum should be set with the widest concave setting and slowest speed that will thresh the seed efficiently. The wind blast is set to give a reasonably clean sample, but not excessively so, for clover seed may easily be blown right out of the header with the fine vegetative matter. It is better to regard the header harvester as a threshing machine and to leave the making of a clean sample to the specialised seed-cleaning machinery than to produce an excellent header sample and lose valuable seed in the process. Paying the extra dressing charges is more economic than losing seed. Broken seed coming into the bag can be seen with the naked eye, but chipped and cracked seeds are harder to observe. The header harvester operator who desires a good sample would be wise to carry a magnifying glass and to examine the sample regularly throughout the day. Threshing conditions vary in one day with changes of temperature and wind, making alterations of header settings necessary. Under very hot, dry, north-west conditions inland it may be necessary to stop harvesting at midday and restart in the late afternoon when the swath "comes back" a little; on the coast the cooler, damp, easterly winds often "bring back" the swath so rapidly that harvesting must be stopped early in the afternoon.

* * *

SUBTERRANEAN CLOVER STRAINS

FOR A NUMBER OF YEARS various strains of subterranean clover have been tried out as surface sowings on hill country in the North Island. Only two have proved of general value—the Mount Barker or mid-season strain and the Tallarook or late-flowering strain. Though both are valuable, they differ in several important respects. The Mount Barker strain is the better winter and spring producer and its vigorous spring growth begins from 3 to 4 weeks earlier than that of the Tallarook strain. This is important where early-spring growth is required. In most of the trials where subterranean clover was useful the Tallarook strain provided the most dense cover. In a number of trials the Tallarook strain established better than did the Mount Barker, especially where grazing was hard in the early stages. In almost all trials it was obvious that the use of phosphatic fertiliser was essential for the establishment of the subterranean clover, irrespective of the strain. Annual re-establishment from seed of both strains is satisfactory, but in many trials that of the Tallarook was better. A very early-flowering, low-producing strain called Dwalganup has also been tried widely, but except in one trial it failed to persist and its use is therefore not recommended.

As a result of these trials it is recommended that in general a mixture of equal quantities of Mount Barker and Tallarook strains be sown. Where early production is of great importance the Mount Barker strain alone should be sown, but where a rapid build-up of the clover content of the sward is desired the Tallarook strain is of greatest value.

Fertiliser Production in New Zealand

Dr. G. L. Bridger's Report

THE problem of fertiliser production in New Zealand, both immediate and long range, with regard to the present and possibly long-continued shortage of sulphur, is studied in the report presented last month to the Minister of Agriculture, Mr. K. J. Holyoake, by Dr. G. L. Bridger, Head of the Department of Chemical and Mining Engineering, Iowa State College, U.S.A., who recently spent nearly 3 months in New Zealand under the sponsorship of the New Zealand and United States Governments.

DR. BRIDGER inspected all the existing fertiliser works and visited places in both the North and South Islands where there were raw materials and potential power sources, and plant sites. Fertiliser problems were discussed with many persons and organisations. Both the immediate problem of meeting shortages created by the lack of sulphur and the long-range problem of increasing fertiliser production to meet future demand were kept in mind.

The full report, which has been printed as a 40-page booklet, is available from the Department of Agriculture, Wellington, at 3s. 6d. per copy.

Since Dr. Bridger's return to the United States meetings of representatives of all interests concerned in fertiliser manufacture and use have studied his report and further inquiries are being made about the practicability of giving effect to his recommendations.

The report concludes that to insure continued production of superphosphate in the present industry at full capacity installation of a pyrites-burning sulphuric acid plant is warranted. For expansion of phosphate fertiliser production it is recommended that the electric furnace double superphosphate process and electric furnace fused calcium-magnesium phosphate process be used. A number of recommendations are made concerning superphosphate manufacture, specifications for phosphate fertilisers and limestone, use of nitrogen fertilisers, and research and development.

Conclusions and Recommendations

The following summary of conclusions and recommendations was part of Dr. Bridger's report:—

"It is probable that sulphur will become plentiful but considerably higher in price when new production facilities for mining and concentrating low-grade deposits have been developed, but it may be several years before this situation obtains. Conversion of part of the present superphosphate industry to use of pyrites would require large capital outlay and would increase the cost of superphosphate, but is warranted to insure maintaining production. The best approach appears to be installation of a pyrites-burning contact sulphuric acid plant in Auckland to supply the three superphosphate works in that area with acid.

"The fertiliser industry should consider drying and granulation as a means of improving the physical properties of superphosphate and compound fertilisers. Studies should also be made to determine whether significant reversion of P_2O_5 to unavailable forms is occurring in the manufacture of super compound and reverted superphosphate.

"Phosphate fertilisers should be labelled and priced on the basis of their available P_2O_5 content, determined by a suitable analytical method.

"Of a number of alternative phosphate fertiliser processes not requiring sulphur or sulphuric acid which have been considered, the electric furnace process for double superphosphate production and the electric furnace process for production of fused calcium-magnesium phosphate offer best possibilities for expansion of the phosphate fertiliser industry. These processes do not require any imported raw materials other than phosphate rock, and appear to be economically competitive with ordinary superphosphate. Estimated production costs of these products are as follows:

	Ordinary superphosphate	Fused calcium-magnesium phosphate	Double superphosphate
	£ s. d.	£ s. d.	£ s. d.
Estimated cost per ton of available P_2O_5—			
At plant	51 7 1	56 3 4	51 6 6
At farm	57 17 1	61 10 0	53 18 6
Made in South Island and delivered to farm in North Island ..	—	—	61 18 6

It is recommended that for further expansion of phosphate fertiliser production, the electric furnace double superphosphate process be used to the extent that an acidic water-soluble product is needed, and the fused calcium-magnesium phosphate process be used where a basic water-insoluble available product is needed. In view of the heavy expense of shipping double superphosphate from the South Island to the North Island, consideration should be given to making sufficient electric power available for its production in the North Island instead of the South Island.

"Test production of double superphosphate and fused calcium-magnesium phosphate should be carried out on a pilot-plant scale from the raw materials to be used for large-scale production. The products should be used in field tests to further prove their suitability, which is already indicated in preliminary tests.

"Studies should be made to determine the extent to which nitrogen fertilisers could be used profitably if they were available at a significantly lower cost. If an electric furnace double superphosphate plant is built, facilities for production of byproduct ammonia from hydrogen made by oxidising phosphorus with steam should be included.

"Specifications for the fineness of grinding required for agricultural limestone should be re-examined when results of field tests now in progress are available. Some method should be worked out for compensating for the calcium carbonate content of limestone, which is variable.

"Research and development in fertiliser manufacture should be encouraged. A number of potential problems are mentioned in the report."

Danger to Bees from Insecticides

BECAUSE of the danger of the poisoning of bees through the residual toxicity of certain insecticides farmers are urged to seek the advice of field officers of the Department of Agriculture regarding the safe period for using any chemicals on pasture land or fruit trees. The possibility of serious losses of bee stocks as the result of indiscriminate use of insecticides is causing concern to beekeepers.

In the article "Grass-grub and Grass Caterpillar Control", published in the August and September issues of the "Journal", J. M. Kelsey stated that experiments had shown that certain chemicals used as insecticides had a residual toxicity lasting more than a year. They were effective against both harmful and beneficial insects and therefore should not be applied when there was danger to pollinating agents such as honey bees.

The danger period to hive bees and other important pollinating insects, such as bumble bees, is September to March inclusive or at any time when nectar sources, including dandelions and buttercups, are in bloom.

Hive bees take in large quantities of water from the foliage of plants for brood rearing in the September-March period and can be destroyed by poisoned water on foliage.

Widespread application of insecticides in spring and summer may also destroy the bumble bee population in any district, as queen bumble bees depend on early pollen and nectar after their period of hibernation. They also work a wide variety of nectar sources for their daily requirements during the brood-rearing season.

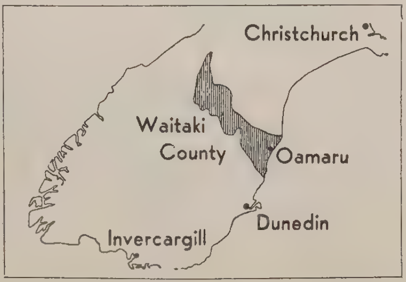
Honey bees perform most of the essential work of plant pollination in New Zealand and most districts are provided with pollinators from commercial apiaries. Heavy mortality of bees through insecticides would be a serious loss not only to beekeepers, but to other branches of farming.

FARMING IN NEW ZEALAND

Waitaki County

ALSO known as North Otago, Waitaki County forms a well-defined farming district bounded by the Waitaki and Ohau Rivers to the north and by mountain ranges, including the Kakanui and Hawkdun Ranges, to the south-west. The total area occupied is 1,407,000 acres, of which 301,000 acres are cultivated and 1,106,000 acres unimproved. In sheep numbers and acreages of cereals and green fodder Waitaki is more important than any other county in the Otago Land District. This, the first section of an article by A. H. Mouat, Assistant Field Economist, Department of Agriculture, Dunedin, traces the history of settlement in the area, describes the topography and climate, and includes a review of the soil types of the county by J. D. Raeside, of the Soil Bureau, Department of Scientific and Industrial Research. The concluding section, to appear next month, will review the present farming pattern.

WAITAKI COUNTY runs inland for about 100 miles at a width of 20 to 30 miles. From near the mouth of the Waitaki River the protecting ranges of the south-west boundary can be seen far up the river valley merging into the distant mountains near the head of the county. The flat river plains and the undulating downlands are characteristic of the low country. Types of farm range from high-country sheep stations to arable farms on the downs and market gardens near the coast. Occupants of this district during the past 100 years have transformed much of it from tussock grassland and native bush held in large sheep runs to a pattern of farming adjusted to the geographic and economic environment of the area. The productivity of the soil varies considerably, but the black "tar" (Waiareka soil) is rated high among New Zealand soils.

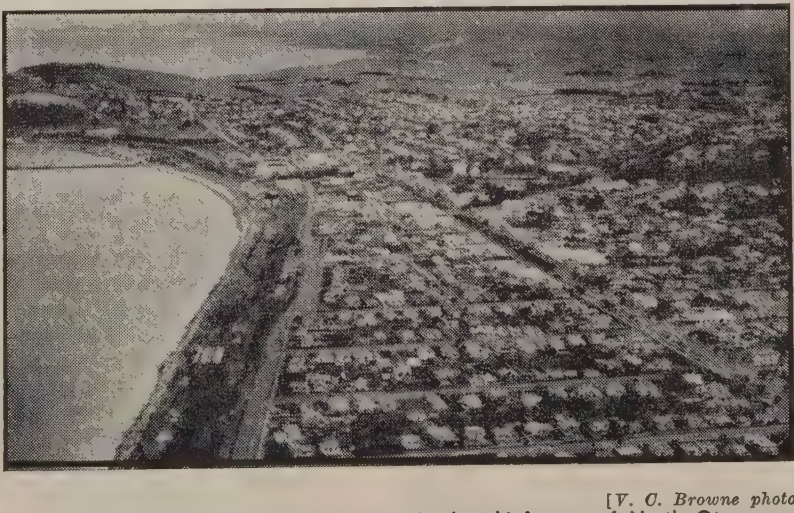


Farm production constitutes the basis of prosperity for the whole population. Oamaru, the leading town, provides the services required by the farming community, acts as a marketing centre for produce, and has some local industries based on primary produce.

History of Settlement

The first settlement of Waitaki County took place about 1850. Probably C. E. Suisted was the pioneer runholder in 1848 near Moeraki and later at Otepopo Station. His claims for the Otepopo and Totara runs were legalised on January 1, 1852. With the occupation of easily accessible land on the Canterbury Plains practically completed by 1850, the search for land carried the squatters into the Waitaki area. By 1856 all land from Kurow to the coast was occupied, and about this time pastoral runs were opened above Kurow in the upper Waitaki Valley. The initial period was characterised by sheep farming on huge runs held under pastoral licence from the Crown or the Otago Provincial Government.

The county, with its central position in the island, attracted settlers from north and south—Englishmen from Canterbury and Scotsmen from Dunedin. Initially the economy was based on wool production. After the discovery of gold in Otago in 1861 many men left the district to join the rush, while some settlers turned their attention to supplying the gold seekers with wheat, flour, meat, and potatoes, and the area soon established a name for cereal production.


[*V. C. Browne photo.*

Oamaru, with a population of about 8000, is the chief town of North Otago and provides services for Waitaki County.

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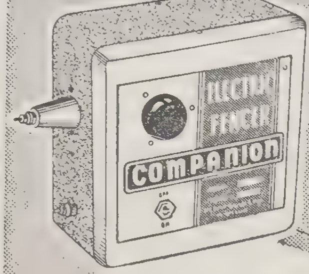

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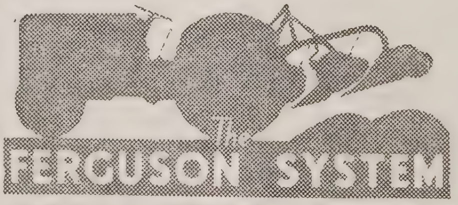

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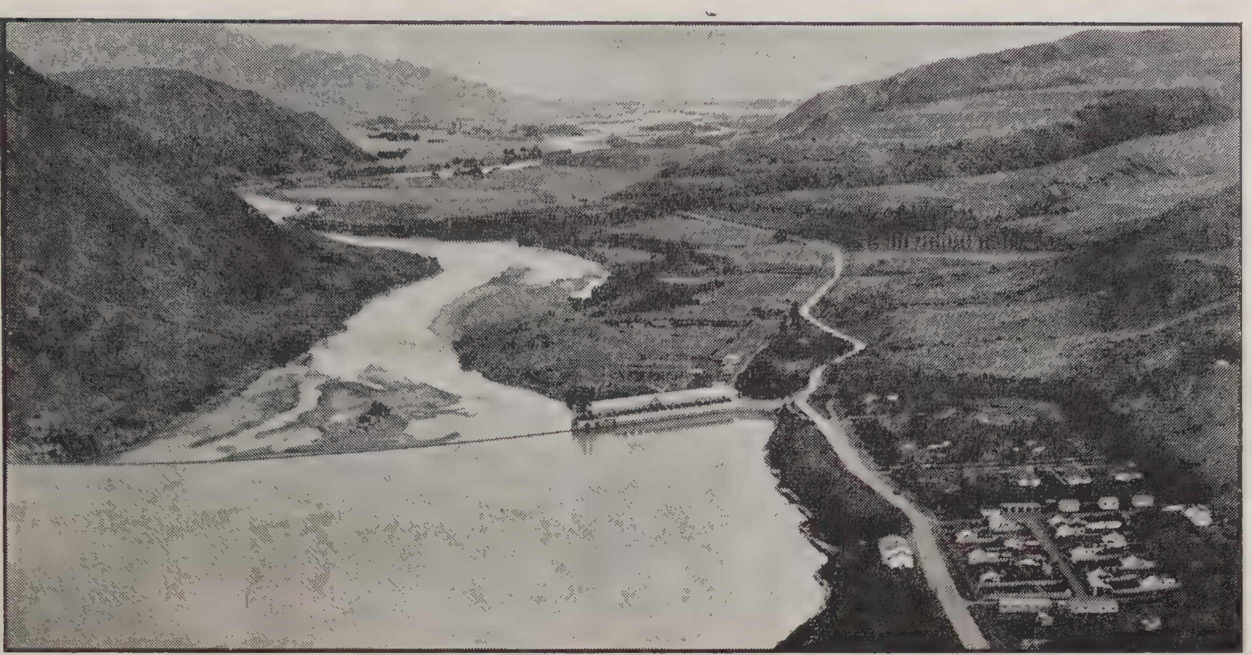
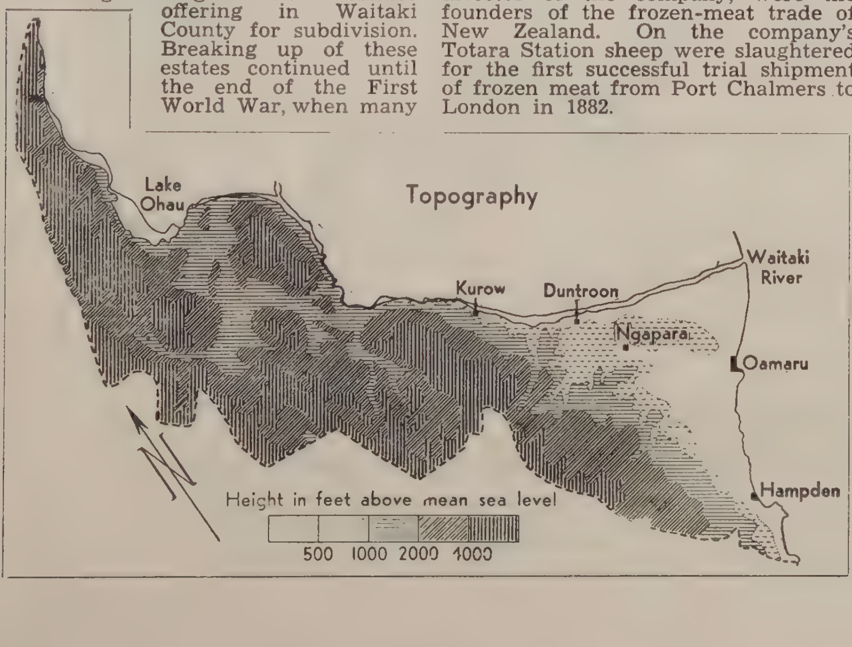


[*V. C. Browne photo.*

Waitaki hydro-electric station and the lake above the dam. A short distance downstream from the dam the river breaks into a number of streams in a wide riverbed which forms the northern boundary of the Waitaki Plain—the main area of flat land in the county.

Most of the land of the low country below Kurow had been bought as freehold before 1870, but considerable subdivision of holdings took place during the boom period following the borrowing policy of Sir Julius Vogel in the 1870's. Railways were constructed, resulting in rapid growth of villages and townships. The demand for building sections, small holdings, and farms caused higher land values. For example, in 1879, 2400 acres of Totara Estate were sold to nine buyers at an average price of £25 per acre. After the bringing down of the land legislation culminating in the Land for Settlement Act of 1894, the Government bought a large number of estates offering in Waitaki County for subdivision. Breaking up of these estates continued until the end of the First World War, when many returned servicemen were settled on the land.



The New Zealand and Australian Land Company, which had a considerable influence on farming in New Zealand, about 1860 acquired 14,500 acres at Totara and in 1861 bought Ardgowan, of 4234 acres; it also leased until 1919 the Dasher Run of 34,460 acres, on which it ran Corriedale sheep. Husbandry was good, and though cereal production was on a grand scale the underlying purpose of cultivation was the renewal of pastures. Thomas Brydone, a superintendent, and W. S. Davidson, a director of the company, were the founders of the frozen-meat trade of New Zealand. On the company's Totara Station sheep were slaughtered for the first successful trial shipment of frozen meat from Port Chalmers to London in 1882.

Topography

The county can be divided into the following topographic regions:—

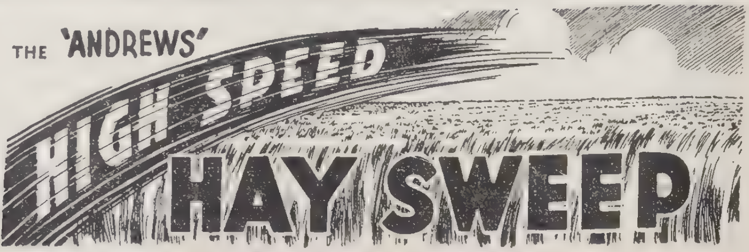
The high country extending from the top of the county along the mountain ranges to near the coast. Here sheep are grazed on large runs. This area comprises country over 2000ft. above sea level, much of it above 4000ft.

The foothills below the high country from near Kurow to the coast, ranging in altitude from 1000 to 2000ft. Sheep are grazed, but more provision is made for winter feeding.

The downs running from the vicinity of Otiake toward the coast and widening considerably from Duntroon, divided by numerous valleys. Sheep farming is followed, in addition to fattening of stock, cereal and seed production, and some dairying. Most of this country is between 100 and 1000ft. above sea level.

The plains: The major area is triangular, formed by a line from Duntroon skirting the downlands to Oamaru, with the Waitaki River and the coast as the other boundaries. Another large area is in the upper Waitaki Plains, lying south of Lake Ohau and extending in a broad arc to the Ohau River facing toward the Mackenzie Plains. Many other pockets of plain are present along the Waitaki River, on its tributaries, and along the Kakanui, Waiareka, and Waianakarua Rivers. Sheep farming is general, the light soils restricting cropping mainly to the provision of feed crops.

The topography has some striking features. Abrupt escarpments of limestone outcrops are common in the downlands area. The southern ranges are a barrier to the cold south-west winds and shut off the valley of the Waitaki from the climatic influence of Central Otago. The level lie of much



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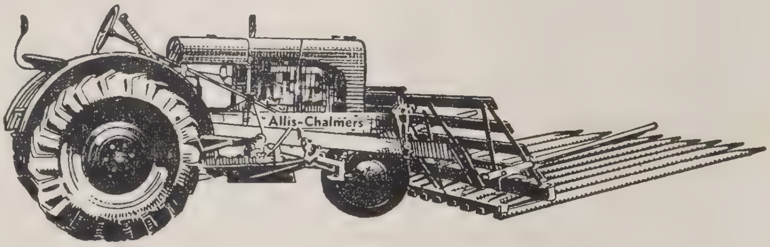

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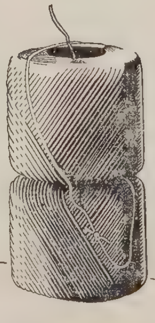

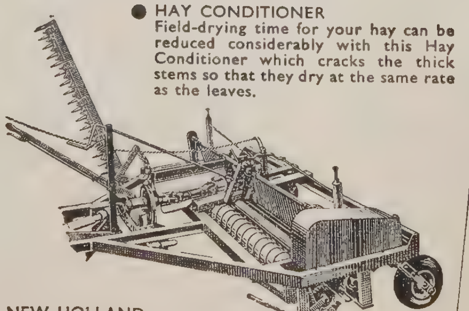

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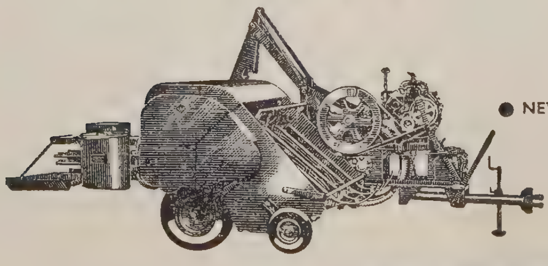

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[*Soil Conservation and Rivers Control Council photo.*

A view over the Omarama Flats, typical of much of the Waitaki high country.

of the plains region is quite important for agriculture and offers possibilities for irrigation.

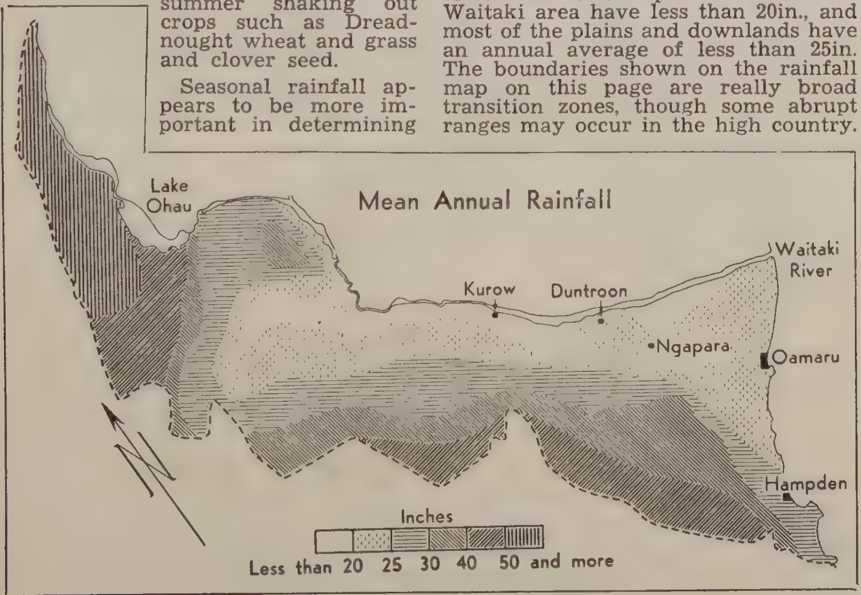
Climate

The climate of the county is conditioned by its position to the east of the Southern Alps, which oppose the prevailing westerly winds of this latitude. This feature, combined with the protection of the south-west ranges, largely determines the climate. Another climatic influence is that of the sea, an influence extending up the valley to Duntroon and sometimes to Kurow. Its tempering effect is felt in summer through easterly breezes well inland and in winter through milder temperatures near the coast.

The north-west "fohn" winds are experienced, particularly in spring and early summer, but they are not as strong or as persistent as on the Canterbury Plains. These drying winds provide ripening weather for crops, but there is the danger of strong winds in summer shaking out crops such as Dreadnought wheat and grass and clover seed.

Seasonal rainfall appears to be more important in determining the success of crops and pastures than in many areas of New Zealand. In Waitaki County seasonal rainfall directly affects yields. After a winter of good rainfall, hard frosts, and snow on the ranges an autumn-sown crop is usually assured of sufficient moisture to carry it through to summer; if rain falls in early summer, a good crop may be expected. Winter rain is important because of its effectiveness, but summer and autumn droughts tend to recur.

With allowances for differences between the capacities of soils to retain moisture, the amount and distribution of rainfall determine many farm practices. In dry years farmers may either buy in feed, mainly swedes and hay, from southern districts or send stock south for grazing. The pattern of rainfall distribution is associated with the topography. From about 60in. annual precipitation at the head of Lake Ohau it falls to 15in. around Kurow. A large area from Duntroon to Omarama and part of the lower Waitaki area have less than 20in., and most of the plains and downlands have an annual average of less than 25in. The boundaries shown on the rainfall map on this page are really broad transition zones, though some abrupt ranges may occur in the high country.



Danger of flooding exists along some watercourses after heavy downpours, but in general the geographic pattern provides good drainage for the land.

Temperature statistics reflect the moderating influence of the ocean and the semi-continental climate of the upper Waitaki area. The annual range of temperature increases inland, summer temperatures at Omarama being higher than at Oamaru and winter temperatures much lower. Agriculturally this is reflected in the length of the growing season for pastures and of the dormant period.

Soils

The soils of the county may be divided for convenience of discussion into those of the high country, the foothills, the downs, and the plains.

Soils of the High Country

All the steep land over 1000ft. above sea level is included in this category. Most of the soils have been developed on steep slopes, but smaller areas of flat to rolling stony soils occur along the Waitaki Valley and in the Ahuriri Basin, which lies between the Ohau and Ahuriri Rivers. These soils may be grouped into Alexandra, Omarama, Hurunui, and Kaikoura types.

Alexandra soils have been developed where the annual rainfall ranges from 17 to 20in. and where summers are hot and dry and winters cold. They are well supplied with plant foods and have been developed under blue and fescue tussock grassland, none of which remains in its original state. Topsoils are brown-grey sandy loams with much rock throughout the profile and unweathered rock close to the surface. Associated with the Alexandra soils are the shallow stony soils of the river valleys and some soils of finer texture in patches along the Waitaki River.

Omarama soils occur under an annual rainfall of from 20 to 30in. Summers are hot and dry and winters cold. Fescue tussock grassland was the dominant native vegetation. The soils are generally grey-brown silt loams of medium natural fertility.

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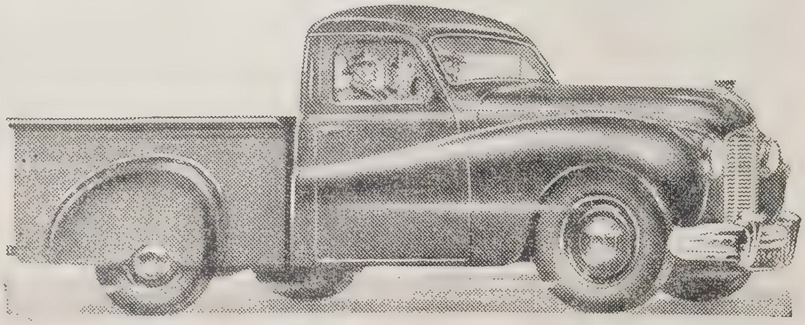

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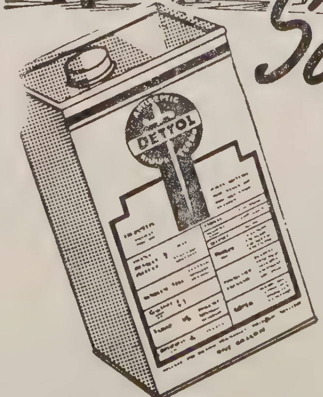

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Associated soils in stony flats and rolling areas are browner in colour and more deficient in plant foods. They require lime and phosphate.

Hurunui soils occur on the Kakanui mountains up to about 3000ft. above sea level. They have been developed under a milder climate than have the Omarama soils where the rainfall is from 30 to 40in. per year. The native vegetation was fescue tussock with much manuka scrub in the deeply incised gullies to the east of the Kakanui Range. They have pale-grey silt loam topsoils and pale-yellowish, heavy, silt loam subsoil. They are poorly supplied with plant food and revert easily to manuka and fern.

Kaikoura soils are generally above 3000ft. on all the high country. They have been developed under snow tussock in cold winters and cool summers. Snow covers them for several months. They are soft, friable, brown sandy loams overlying yellowish stony sands with angular fragments of the parent rock throughout the profile. They have low natural fertility and erode readily under poor management. Associated soils developed under mountain beech occur in the valleys near the Southern Alps, and associated rolling and flat soils on high terraces and moraines occur in the Ohau Valley; these are also of low natural fertility.

[Soil Conservation and Rivers Control Council photo.

Erosion in the high country.

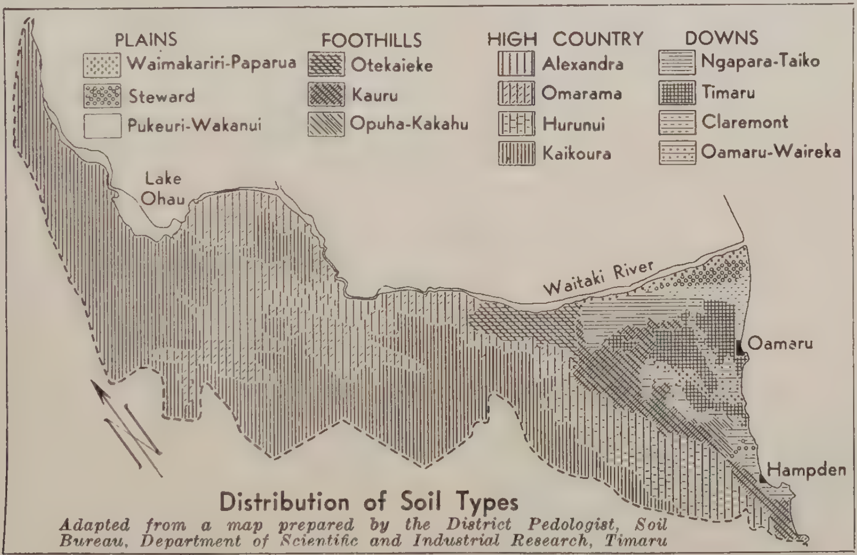
Soils of the Foothills

On the foothills the Otekaieke and Opuha-Kakahu soils have been developed on deep, loess-like material, but the Kauru soils occur where the loess is very thin and have been formed almost wholly from the underlying sandstone.

Otekaieke soils occur in the Duntroon-Kurow district, where annual rainfalls range from 17 to 20in. Summers are warm and dry and winters cold and dry. The soils are brownish-grey, friable silt loams with a soft, fine, granular structure overlying compact, pale yellowish-grey, sandy loams. They have a good supply of plant food, but dryness limits their utilisation. Associated soils developed on limestone and calcareous sandstone occur west of Duntroon. Other soils within the area mapped as Otekaieke soils are those developed on alluvium along the Otekaieke, Otiake, and Waitaki Rivers; these alluvial soils are for the most part stony.

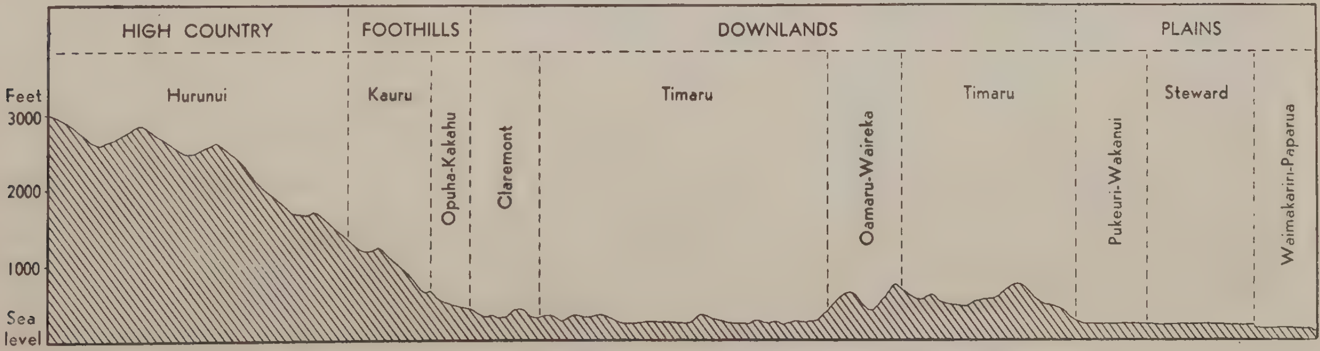
Kauru soils have been developed on a coarse sandstone with a high silica content under an annual rainfall of 20 to 35in. Some bands in the sandstone are cemented into a hard mass which outcrops in places to form steep scarps. The Kauru soils are poorly supplied with plant foods and require topdressing with lime and phosphate. Their topsoil textures range from silt loam to sandy loam and they are somewhat drier than neighbouring soils formed on loess. Lying close to the margin of the Kakanui Range and mapped with the Kauru soils are some small areas of soils developed on loess.

Opuha-Kakahu soils are on the wetter margin of the downs flanking the Kakanui Range where the rainfall is more than 30in. per year. Both soils are poorly supplied with plant foods. The Opuha soil is slow draining and has a brownish-grey silt loam topsoil and a compact subsoil with pronounced yellowish-brown and grey mottling. The Kakahu soil has been formed where the loess is shallower over greywacke rock; the topsoil is a light-grey silt loam with a soft crumb structure and the subsoil yellowish with better drainage properties than those of the Opuha soil.


PLAINS
Waimakariri-Paparua
Steward
Pukeuri-Wakanui
FOOTHILLS
Otekaieke
Kauru
Opuha-Kakahu
HIGH COUNTRY
Alexandra
Omarama
Hurunui
Kaikoura
DOWNS
Ngapara-Taiko
Timaru
Claremont
Oamaru-Waireka
Lake Ohau
Waitaki River
Oamaru
Hampden

Distribution of Soil Types

Adapted from a map prepared by the District Pedologist, Soil Bureau, Department of Scientific and Industrial Research, Timaru


HIGH COUNTRY
FOOTHILLS
DOWNLANDS
PLAINS
Feet
3000
2000
1000
Sea level
Hurunui
Kauru
Opuha-Kakahu
Claremont
Timaru
Oamaru-Waireka
Timaru
Pukeuri-Wakanui
Steward
Waimakariri-Paparua

Soil profile in relation to topography from Kakanui Ranges to Waitaki River.

[J. U. Macaulay photo.

The Waiareka Valley with the Kakanui Range in the background. The fertile Waiareka soil in the foreground supports mixed arable farming, and on the downlands mixed sheep farming is favoured.

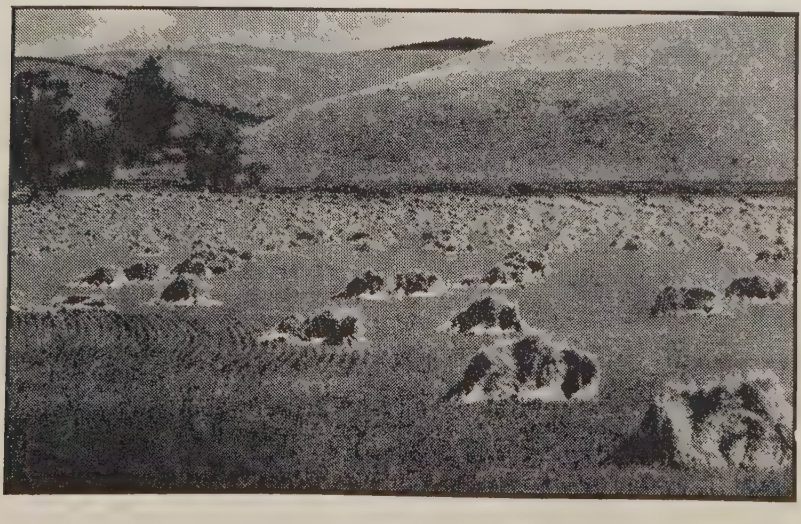
Soils of the Downs

The deep, loess-like material that forms a discontinuous cover over most of the downs is the parent material of the Ngapara-Taiko, Timaru, and Claremont soils, but in some places where the loess is thin the underlying rocks, such as those on which the Oamaru-Waiareka soils have been developed, contribute largely to the soil-forming material.

Ngapara-Taiko soils occur between Peebles and Duntroon, where rainfalls are between 20 and 25in. per year. Fescue tussock was the dominant native vegetation. The Ngapara soil has a grey-brown, crumbly, fine sandy loam topsoil and a slightly compact subsoil; it is fertile but dry. The Taiko soils are stony and have been developed on old gravel deposits. As the surface slopes range from easy rolling to moderately steep, hill soils (on slopes steeper than 15 degrees) are scattered widely through the district.

Timaru soils are grey in the topsoil and have a silt loam texture. They lie to the south of the Ngapara soils, between Tokarahi and the coast. Rainfall there is somewhat higher than on the Ngapara soils, the topsoil has a stronger crumb structure, and the subsoil is more compact. The Timaru soils are fertile, but require superphosphate where they are intensively farmed. Within this area are places where the loess cover is thin or missing and soils have been developed on the underlying limestone and sandstones.

Claremont soils occur to the south of the Timaru soils and nearer the Kakanui Range, where the rainfall is from 25 to 30in. per year. They have greyish silt loam topsoils with a weak crumb structure and mottled, compact, heavy silt loam subsoils. They are more leached than the Timaru soils and require lime and superphosphate to maintain high production.



A paddock of oats in stook on the Pukeuri-Wakanui soils along the margin of the downs, where mixed farming is common.

Oamaru-Waiareka soils consist of a complex mosaic of two soils, the Oamaru formed on limestone and the Waiareka formed on basaltic tuff. The Oamaru soils, mostly clay loams of high natural fertility, cover the greater part of the area between Totara railway station and the mouth of the Kakanui River. Waiareka soils, which predominate in a strip a little to the west of the Oamaru soils, also have clay loam textures and are of high natural fertility. Because the dark-brown clay loam topsoils when wet have a characteristic bituminous look and feel, both soils are known locally as "tarry soils".

Soils of the Plains

On the plains the Waimakariri-Paparua soils and the Steward soils have been developed on gravelly alluvium brought from the high country by the Waitaki River. The Pukeuri-Wakanui soils have been formed largely on material washed from the downs.

The Waimakariri-Paparua soils flank the Waitaki River. They are for the most part coarse in texture and are stony, shallow, and dry. There are, however, some small patches of deep fertile soils.

The Steward soils lie on the remnant of the ancient fan of the Waitaki River and have been formed from coarse greywacke alluvium. Most of them are stony, shallow, and dry and, moreover, are poorly supplied with plant foods. A hard cemented band in the gravels lies 18 to 24in. below the surface.

The Pukeuri-Wakanui soils lie along the margin of the downs between Georgetown and Pukeuri. They are moderately fertile. Textures vary widely, but in most places the topsoils are silt loams and the subsoils somewhat compact, heavy silt loams. Drainage through the soil is poor. There are many small patches and strips of stony soils, and near the coast are some small areas with especially poor drainage.

Peach and Nectarine Culture

THE chief troubles affecting peaches and nectarines are fungous diseases and insect pests, although those of bacterial, virus, physiological, or deficiency origin cannot be discounted. Control of diseases is one of the major factors in successful orchard management and unless proper measures are carried out the effort expended on other cultural operations may largely be nullified. This, the concluding section of an article by W. S. Kemp, Orchard Instructor, Department of Agriculture, Alexandra, describes the principal diseases and pests affecting peaches and nectarines and measures for controlling them.

[R. W. Orr photo.

Application of sprays must be well timed and thorough if diseases and pests are to be controlled.

MOST diseases and pests are normally controlled by the application of sprays. The apparatus used to apply sprays must be capable of performing to the full the task required of it and for the spray to function efficiently all parts of the tree must be covered thoroughly with the preparation used. Failure to obtain satisfactory control is often caused through inadequate spray coverage; also, as sprays are normally applied to prevent rather than to cure troubles, it is essential that they be applied at the correct time to achieve their object.

Diseases

The principal diseases which affect peaches and nectarines are:—

Brown Rot (*Sclerotinia fructicola* Schroeter)

Brown rot is one of the most serious fungous diseases attacking peaches and nectarines and is found in all districts. It attacks blossoms, shoots, leaves, and fruit, causing death of blossoms, cankers on shoots, perforations in leaves, and rotting of fruit. Its effects are not limited to the orchard, as fruit may become infected after harvesting or during transit and may open up in poor condition on arrival at its destination.

There are two main periods of infection, at the blossom stage and before harvest. Blossom infection usually occurs during wet spring conditions and attacks the flowers as they open. After infection flowers die and turn brown and the fungus travels down the flower stem into the twig, causing a small canker or death of the twig. Usually all blossoms are not killed, although in some seasons the majority may be lost.

Brown rot is rarely seen on green fruit, but the danger of infection increases as the fruit approaches maturity. Though the disease may attack sound fruit, entry is more often gained through injury caused by insects or by mechanical damage to the skin. The rot begins as a small brown spot which enlarges rapidly, so that the whole fruit may be affected in a few days. The fruits eventually mummify, and as the fungus overwinters in these shrunken fruits, their destruction aids in control of the disease the following season.

Brown rot is most difficult to combat, as it is not controlled by spraying alone. Further action is necessary to minimise infection, and attention to hygiene in the packing shed and in the orchard (by the destruction of mummified fruits, removal of infected shoots, and care in picking, grading, and packing to avoid injury) is essential. The soil should not be disturbed during blossoming, as it is at this period that brown rot spores are discharged. If infected material is buried more than 1in. below the soil surface, spores will not be formed. Thinning reduces the danger of infection through fruits touching.

Besides the elimination of sources of infection the use of sprays, if the programme is adequate, will help prevent infection from spores which may be carried from adjoining sources of infection.

Silver Leaf (*Stereum purpureum* Pers. ex Fries)

Silver leaf is one of the most serious diseases affecting peaches and nectarines. It attacks many different plants, but it is in stone fruits that its effects are most severe. An unfortunate feature is that it cannot be controlled by spraying.

The first indication of infection is a silvering of the leaves. As a rule it shows on one or two of the smaller branches, spreading until the whole leader is affected and eventually attacking the whole tree. It may be several seasons before the whole tree is affected. Simultaneous infection of the whole tree is rare and is the result of infection gaining entry through roots or trunk. Death of the tree usually results, though occasionally trees have been known to recover.

The fungus infects living trees only through wounds, which in the course of normal orchard practice are constantly being inflicted. It is spread only by spores produced on the fructifications found on dead wood of host plants such as poplar and willow.

To reduce incidence of the disease, if not to prevent it entirely, all material that shows sign of silver leaf should be removed and burnt. All large pruning cuts or wound surfaces should be given a protective covering as soon as possible after cuts are made.

As the fungus is carried in the sap stream, it cannot be reached by the normal sprays. Injections into the tree of substances toxic to the fungus have so far proved useless as a means of control.

Leaf Curl (*Taphrina deformans* (Fcl.) Tulasne)

Leaf curl is common in all districts, its severity varying according to the susceptibility of the variety and to climatic conditions. Infection is usually more severe under warm, humid conditions.

Leaves, shoots, blossoms, and fruit may be infected, but the main effects are seen in the young leaves. Attack takes place after the young leaves have unfolded from the bud, causing them to become thickened, blistered, and wrinkled with a distinct curling inward. Diseased leaves acquire reddish or purplish tints and later show a silvery coating on the surface. Infected leaves finally die, turn brown, and may fall or remain attached to the lateral. New leaves are developed at the expense of the reserve supplies stored in the tree. Loss of leaves not only weakens the tree but may destroy the present crop and seriously affect the following season's crop also.

Young fruits when infected become distorted owing to the area of infection becoming enlarged. Such fruits seldom remain long on the tree, as they become scabbed and cracked and then fall. Though this phase is not generally recognised, maturing fruits are also attacked. As a result swollen, irregular-shaped, usually bright-coloured areas appear on the surface of the fruit; these areas are wrinkled, and on peaches hairs are absent. On nectarines the bright coloration is conspicuous and gives a false impression of maturity.

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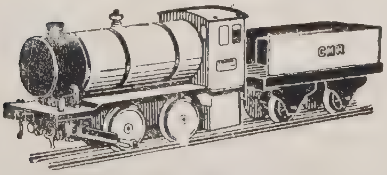

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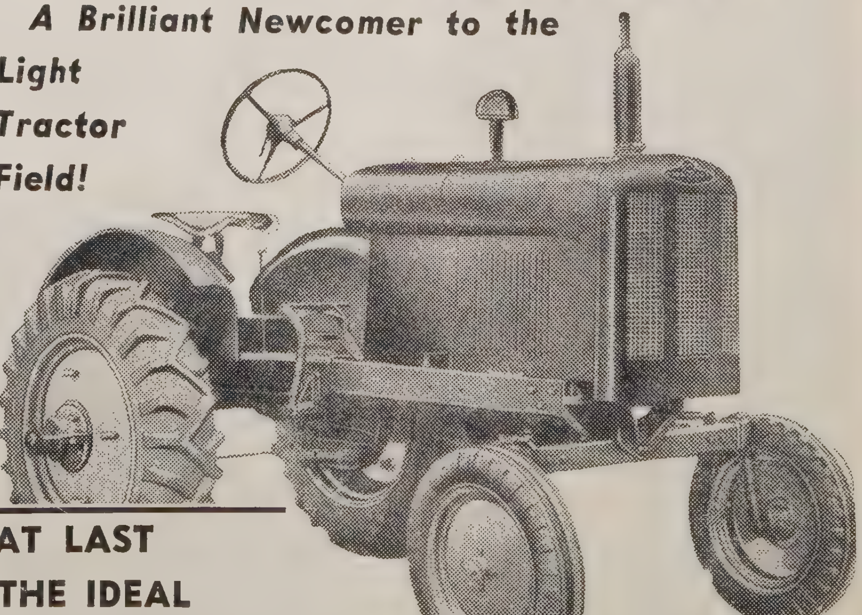

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To control this fungus it must be prevented from gaining entry; once the symptoms occur sprays are of no value. One spray thoroughly applied before bud movement will normally afford good control. On those varieties which are more subject to attack a second spray may be necessary to secure effective control. Failure to obtain control can usually be traced to lack of thorough spray coverage or to applying sprays too late after buds have started to open.

Peach Scab (*Cladosporium carpophilum* Thuemen)

Peach scab attacks the fruit, leaves, and shoots. It causes dark shallow spots, which detract from the appearance and value of the fruit. In cases of severe infection fruits may become so scabbed and cracked as to be unsaleable. Because of the presence of these cracks, fruits are more susceptible to brown rot attack.

The disease is not normally troublesome, as it is readily controlled by sprays, provided they are applied at the correct time and strength. Normally two sprays are sufficient, but more may be necessary on late-maturing varieties.

Shot Hole (*Phyllosticta prunicola* Saccardo)

Shot hole disease attacks leaves and shoots of peach and leaves only of nectarine. Leaf infection is the only phase that may be considered at all serious, shoot infection being rare. On the leaves small, brown, circular spots are formed; these soon become brittle and fall away, leaving the characteristic appearance which gives the disease its name. Its main effect is the loss of healthy leaf surface.

As the fungus over-winters on fallen leaves, the disease will be checked if fallen leaves are turned under before spring growth begins and the trees are sprayed at bud movement. A shot hole condition may be caused by other fungi as die-back, peach scab, and brown rot.

Die-back (*Clasterosporium carpophilum* (Lev.) Aderhold)

Die-back is of historic interest, as it was mainly responsible for the dying out of the "Maori peach", once so common in the North Island. Fruit, leaves, and shoots are all subject to die-back attack.

In rare cases fruit may be damaged to such an extent as to be unsaleable. Normally, however, the attack takes the form of small, light brown pustules on the surface of the fruit, frequently accompanied by cracking and gumming; infected fruits are usually smaller

Leaf infection produces a conspicuous shot hole effect when the attack takes place early in the season; otherwise the infected area, consisting of a light brown spot surrounded by a purple margin, remains until the leaf falls.

On the shoots irregular cankers are formed. Usually these continue to enlarge until the shoot becomes encircled and death results, giving rise to the characteristic appearance from which the disease derives its name. Often gumming is associated with death of the shoot.

Fortunately spraying has proved effective in the control of die-back, but it should be supplemented by the removal of all infected material at the time of spraying. As the main source of infection is from spores lodged in the bud scales, spraying is best delayed until bud movement. The one spray then acts as a control for several diseases.

Leaf Rust (*Puccinia pruni-spinosae* Pers.)

Leaf rust is found wherever peaches and nectarines are grown and attacks the leaves and sometimes shoots and fruit. It takes the form of small, bright yellow areas on the undersides of leaves, and the areas are visible on the upper surfaces as discoloured, irregular-shaped spots. Finally leaves turn yellow and fall in succession from the base of the shoot upward until only the young leaves remain at the tip.

On the fruit small, circular, depressed spots are formed. These become conspicuous as the fruit matures through the formation of a reddish border around the spots. In cases of severe attack fruit may be deformed. Where shoot infection occurs small cankered areas are formed and the bark splits lengthwise.

Leaf infection may be followed by a premature leaf fall or even defoliation, depending on severity of the attack. As the tree depends upon its leaves for processing of plant foods, this loss weakens the tree and, besides reducing the prospective crop, may leave the tree more susceptible to attack from other diseases.

Control measures are the same as for other fungous diseases and consist of adequate orchard hygiene, early cultivation to bury the fallen leaves, and the application of protective sprays.

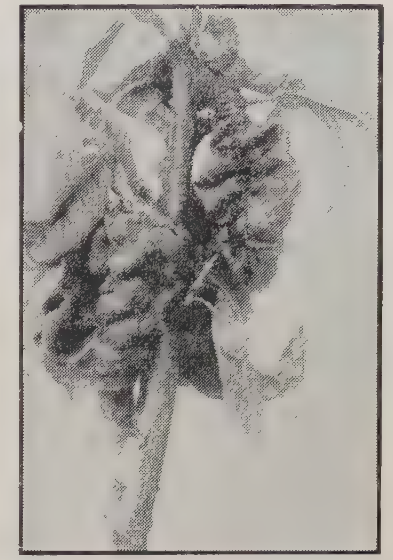
Coral Spot (*Nectria cinnabarina* (Tode) Fries)

Coral spot is a wound parasite, and through an injury may infect trunks, leaders, laterals, and sometimes roots. It occurs as a parasite on living material or as a saprophyte on dead wood remaining on trees or lying on the ground in and around the orchard.

The effects of the parasite vary according to the position of infection and severity of attack. Where a single branch is attacked it may be killed in one season, death being preceded by sudden wilting of the foliage and shrivelling of any fruit on it, or the infected branch may live for several seasons, making little growth. In the latter case leaves remain small and yellowish and any fruit produced seldom matures.

If infection occurs in the trunk, the tree usually dies the same season. Infection is followed by sudden wilting of leaves and shrivelling of fruit; they do not fall, but remain on the tree until some little time after their death, which is usually preceded by gumming.

Shortly after the infected portion has been killed small, bright pink pustules appear through the dead bark. The presence of these preceded by the wilting of leaves indicates the presence of coral spot, but the fungus may be present as a saprophyte, death being due to some other cause.



Peach shoot affected with leaf curl (*Taphrina deformans*).

The organism spreads from fructifications produced on wood which has been killed by it previously or from other dead woody material lying about the orchard on which it may be living. As it is a wound parasite, it can attack a tree only through an exposed wound surface in which dead tissue is present.

Control measures consist of removing all dead wood from trees during pruning and of collecting and burning all prunings and other rubbish adjacent to the orchard, thus reducing sources of spore production. All exposed wound surfaces should be given a protective covering.

Valsa Injury (*Valsa leucostoma* (Pers.) Fries)

Valsa injury results in the die-back of limbs and laterals. The first indication of its presence is the wilting of the affected portion. The leaves then turn brown and fall away, leaving the branch bare and therefore most conspicuous. Usually gumming occurs at the junction between dead and living portions of the branch either before or during wilting. Later minute pustules appear on the dead wood and from these are produced long, coiled, slender, gelatinous tendrils, usually light red or amber coloured.

This disease gains entry only through open wounds or dead laterals or through trees being weakened by some other agency, so that where trees are well cared for and make good growth there is little danger of its proving troublesome.

Control measures are the same as for coral spot.

Insect Pests

Insect pests can be placed in two groups, chewing and sucking insects. The first group, of which caterpillars are the major pest, can be controlled by the use of stomach poisons, and for the second and larger group, containing aphides, scales, and mites,

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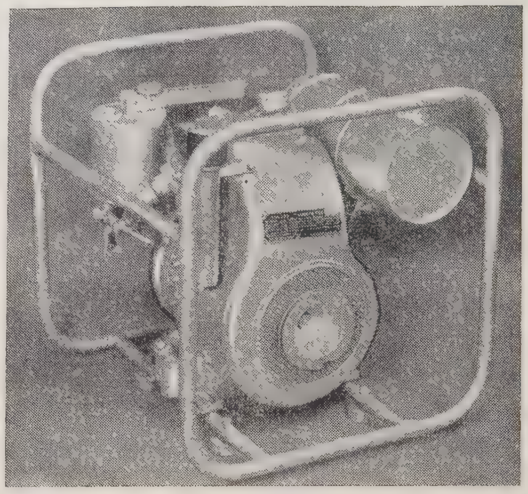

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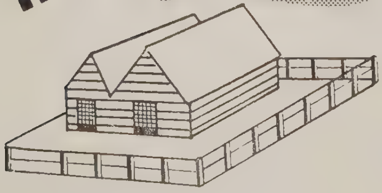

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a contact poison is required. The second group is generally more difficult to deal with.

Aphides

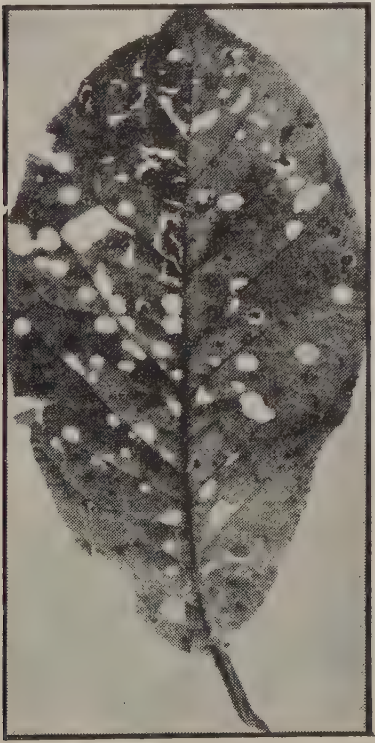
Two species of aphides have been commonly recorded on peach and nectarine: Green aphis (*Myzus persicae* Sulz.) and black aphis (*Brachycaudus prunicola*). A third species sometimes recorded, *Rhopalosiphum nymphacae*, is rather uncommon on these hosts.

Aphis infestation is affected by seasonal conditions. In normal seasons there may be only short slight infestation, in others it may be moderately short but heavy, and periodically infestations of great intensity continuing over a considerable period may be experienced. Most damage is done in spring, the young foliage often being severely stunted and curled. Severe attacks may cause defoliation, bud drop, fruit drop, and general weakening of trees.

In districts which have cold winters the green aphis passes the winter in the egg stage on the tree. Eggs, which are laid on the wood at the bases of buds, are light in colour at first, but later change to shiny black. They hatch in spring, when the buds burst and there is succulent foliage upon which the young aphides can feed. However, in warmer climates they can pass the winter in the adult form on any suitable host plants that are in leaf at the time. Brassicas are favourite winter food plants and aphides can be found on these hosts all the year round.

Scales

Though scales are not usually of consequence on peaches and nectarines, two species can become troublesome and cause temporary damage. These are the San Jose and the brown lecanium scales. Both have a wide range of hosts.



Shot hole on Japanese plum leaf. Similar damage occurs on peaches and nectarines.

San Jose scale (*Quadraspidiotus perniciosus* Comstock): This is the most destructive of scale insects which attack deciduous plants. Owing to its small size it is often overlooked until it becomes epidemic. Bark, fruit, and leaves can become infested by these greyish scales, a characteristic feature of infection being the discoloration of the attacked tissue, which turns a distinct red or purple. The scale probably passes the winter in an almost mature state. The young reach maturity and begin to reproduce about 6 weeks after birth, there being several generations in a season.

Brown lecanium scale (*Saissetia* spp.): This scale is common throughout the country and frequently causes damage. The adult scale is oval, dome shaped, brown, and about 1/6in. long.

Control of both scales can be effected by applying winter oil or strong lime sulphur while trees are dormant.

Mites

European red mite (*Paratetranychus pilosus*) and **brown clover mite** (*Bryobia praetiosa* Koch.): Infestations of the European red mite and the brown clover mite are not usually severe, but they can become serious in some seasons. By sucking the sap these mites cause injury to the foliage, which assumes a brown appearance owing to drying of the tissue where it is punctured by them when feeding.

The winter eggs, which are deep reddish, are laid in crevices of the bark and from these the young hatch out in spring. As they develop to the adult stage in about 14 days, several generations are produced during the season.

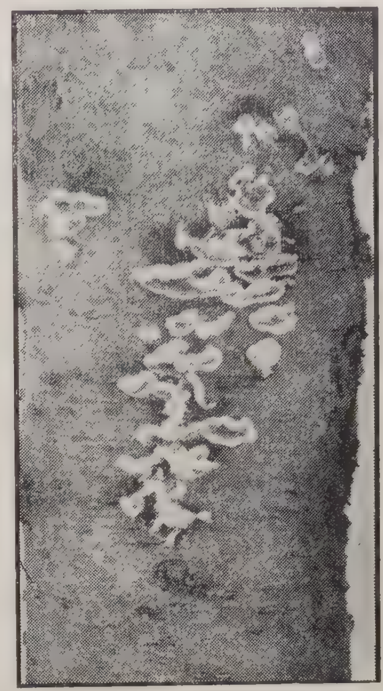
Leaf-roller Caterpillars (*Tortrix* spp.)

The adults of leaf-roller caterpillars are moths. Eggs are laid on the foliage and take 10 to 14 days to hatch. The life of caterpillars varies from 1 to 2 months according to the time of year.

As their name implies these caterpillars roll up leaves or tie leaves together or to fruit by webbing. Their importance as pests lies in the fact that they chew the skin of the fruit, causing blemishes which may be extensive, thus impairing its market value. Nectarines, because of their smooth skins, are much more susceptible to attack than peaches.

European Earwigs (*Forficula auricularia* L.)

European earwigs sometimes prove troublesome and have caused considerable damage in some years, especially in Central Otago. During winter the insects lie underground, where the females will be found with their clusters of eggs. These hatch in spring and the small, whitish young emerge to feed, largely upon pollen and pistils of flowers. At this stage neither the insects nor the damage done are very noticeable, but both become more conspicuous as the insects grow and attack foliage and fruit. The insects are nocturnal in habit, and during the day they shelter under debris lying on the ground or may even burrow into the soil.



Silver leaf (*Stereum purpureum* Pers. ex Fries) fungus on bark of peach.

Control consists of clean cultivation to remove all possible means of shelter, tree banding with some tacky substance to prevent earwigs from travelling up tree trunks, and trapping or the use of poison baits.

Gummosis

Gummosis is a physiological disease. The name is applied to the exudation of gum through the bark of the tree or skin of the fruit. This may be induced by various causes such as diseases or wounds, but the term applies where the gumming is apparently not caused by any of these agencies. Though the effects of gummosis are generally slight, occasionally it has a detrimental effect upon trees, and where fruit is affected its sale value is reduced.

As the cause of this condition is not known, little can be done to remedy the gumming. Certain varieties appear to be more subject to this trouble and these should be avoided in any future planting.

Frost Injury

Frost injury is confined mainly to certain districts, but it occurs in others occasionally. Late spring frosts frequently result in partial or total loss of crop and may affect growth. In Central Otago autumn frosts and, on rare occasions, winter frosts may cause damage to buds, laterals, and even branches.

Brown rot (*Sclerotinia fructicola*) on peach shoots.

Trace Element Deficiencies

Little is known of the requirements of peaches and nectarines in respect of trace elements. Various deficiencies are known to occur in other fruits when grown in the same soils as peaches and nectarines; for example, boron deficiency in apples and apricots. However, manganese is the only element for which deficiency symptoms have been established and these occur in parts of Auckland, Hawkes Bay, and Central Otago. Other deficiencies are suspected and trials are at present being conducted to ascertain if they occur.

Manganese deficiency is characterised by a uniform pattern of pale green or yellowish colour between the leaf veins, and growth and crop may be reduced. Sprays of manganese sulphate applied on young leaves are effective when used at 6lb. per 100 gallons of water. Though it is usual as a precaution to add hydrated lime at the rate of 8lb. to the 100 gallons of water when applying trace elements to counteract deficiencies, recent work has shown that manganese may safely be applied alone. The usual black residue left by the mixture is thus avoided.

Rabbits and Hares

Rabbits in particular are abundant in some districts and cause considerable damage, especially to young trees, by gnawing the bark and eating the young shoots. Netting fences, the use of repellants, trapping, and shooting are the chief means of combating rabbits and hares.

Acknowledgment

Acknowledgment is made to the Plant Diseases Division of the Department of Scientific and Industrial Research for assistance in the preparation of the section dealing with diseases and their control.

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GENERAL SPRAY PROGRAMME FOR PEACHES AND NECTARINES

Period of application	Formula used	Disease or pest
*Dormant	Winter oil 5 per cent.	Scales, red mite, green aphis
Leaf bud movement	Bordeaux 5:4:50	Leaf curl, shot hole, die-back
†10 days later	Bordeaux 3:4:50	Leaf curl, shot hole, die-back
‡Early pink	Lime sulphur 1:100 plus 40 per cent. colloidal sulphur 2:200	Brown rot blossom infection, shot hole, leaf rust, peach scab, die-back
‡Petal fall	Lime sulphur 1:150 plus 40 per cent. colloidal sulphur 2:100	Brown rot blossom infection, shot hole, leaf rust, peach scab, die-back
§Month later	Lime sulphur 1:150, colloidal 2:100, basic lead arsenate 3:100, nicotine sulphate 1:800	Brown rot blossom infection, shot hole, leaf rust, peach scab, die-back, leaf-roller caterpillar, green aphis
§Month later	As above	As above.
Two weeks before harvest	Lime sulphur 1 : 150, colloidal sulphur 2 : 100	Brown rot
Leaf fall	Bordeaux 5:4:50	Brown rot, leaf curl

* Necessary only when scales, mites, or aphides are troublesome.
† Necessary only on varieties more subject to leaf curl.
‡ Necessary only when brown rot infection is likely on blossom.
§ Basic lead arsenate and nicotine sulphate are necessary only when leaf-roller and other caterpillars and green aphis are present.

Show Dates

THE following are dates and venues of A. and P. shows up to March 1.

December 1—Helensville A. and P. at Helensville.

*December 1—Tokomairiro A. and P. at Milton.

December 1—Winton A. and P. at Winton.

*December 1—Whangaroa A. and P. at Kaeo.

December 4 and 5—Gore A. and P. at Gore.

*December 8—Kaikohe A. P. and H. at Kaikohe.

December 8—Wyndham A. and P. at Wyndham.

*December 11 and 12—Southland A. and P. at Invercargill.

December 15—Otago Peninsula A. and P. at Portobello.

January 1—Nuhaka A. and P. at Nuhaka.

*January 11 and 12—Wairoa County A. and P. at Wairoa.

January 12—Blueskin A. and P. at Waitati.

January 19—Central Hawkes Bay A. and P. at Waipukurau.

January 19—Waikouaiti A. and P. at Waikouaiti.

*January 23—Marton District A. and P. at Marton.

January 25 and 26—Horowhenua A. and P. at Levin.

January 26—Waiau A. and P. at Tuatapere.

January 26—Palmerston and Waihemo A. and P. at Palmerston.

January 29 and 30—Feilding I. A. and P. at Feilding.

February 2—Clevedon A. and P. at Clevedon.

February 2—Rodney Agricultural Society at Warkworth.

*February 2—Woodville A. and P. at Woodville.

*February 5 and 6—Dannevirke District A. and P. at Dannevirke.

February 8—Dannevirke Ram Fair at Dannevirke.

February 8 and 9—Taranaki Metropolitan A. and P. at New Plymouth.

February 9—Golden Bay A. and P. at Takaka.

February 9—Hukerenui A. and P. at Hukerenui.

February 9—Katikati A. and P. at Katikati.

February 9—North Kaipara Agricultural Association at Paparoa.

*February 9—Pahiatua A. and P. at Pahiatua.

February 9—Waitemata A. and P. at Waiwera.

February 13 and 14—Ohura A. P. H. and I. at Nihoniho.

*February 15 and 16—Franklin A. and P. at Pukekohe.

February 15 and 16—Masterton A. and P. at Masterton

February 15 and 16—Taumarunui and District A. and P. at Taumarunui.

*February 16—Murchison A. and P. at Murchison.

February 16—Rangitikei A. and P. at Taihape.

February 16—Tauranga A. and P. at Tauranga.

February 20—Te Awamutu A. and P. at Te Awamutu.

February 22 and 23—Wellington and Hutt Valley A. and P. at Upper Hutt.

February 23—Banks Peninsula A. and P. at Little River.

February 23—Putaruru District A. and P. at Putaruru.

*February 23—Te Puke A. and P. at Te Puke.

February 23—Waimarino A. P. H. and I. at Raetihi.

*February 27—Opotiki A. and P. at Opotiki.

March 1—Albany A. and P. at Albany.

March 1—Amuri A. and P. at Rotherham.

March 1—Maniototo A. and P. at Ranfurly.

*March 1—Matamata A. and P. at Matamata.

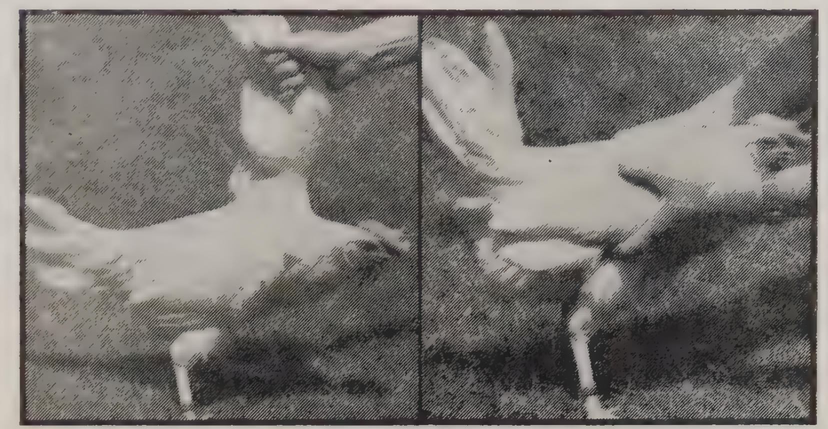
March 1—Mangonui County A. and P. at Kaitaia.

March 1—Temuka and Geraldine A. and P. at Winchester.

* The Department of Agriculture exhibit will be staged at this show.

Catching, Holding, and Carrying Household Poultry

PEOPLE inexperienced in handling any kind of stock often criticise some special way of holding poultry as being cruel, but very few people are cruel, wilfully or unintentionally, when catching and holding birds. Methods must vary for different species because of the wide difference between the wings of a fowl and a pheasant, the legs of a turkey and a duck, or the neck of a goose and a bantam. A hen can withstand handling that would injure a chicken. In this month's article for the household poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, gives advice about catching, holding, and carrying birds.



A bird may be caught by a wing, a leg, or even the neck, but should not be held for long by one of those extremities. She should be lifted by two hands gripped around her body and wings, with the fingers holding her legs and preventing struggling.

HOUSEHOLD poultry do not present the same problems of handling as do commercial poultry, chiefly because numbers are smaller and space is more restricted in both housing and runs, but in too many household flocks insufficient attention is given to catching sick fowls for examination and to culling. Inexperience in judging laying ability and diagnosing ailments should not deter an owner from catching birds under suspicion, as common sense, observation, and a little experience and reading will soon enable the reaching of a fairly reliable conclusion.

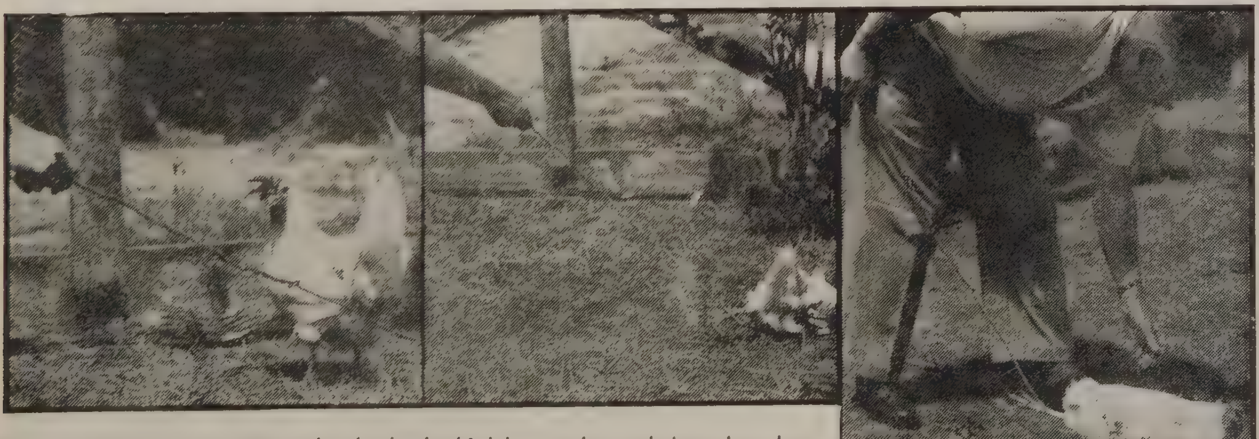
Some household poultry flocks receive constant attention and are treated more like children, the birds becoming very tame. Other fowls are fed in a hurry and see so little of the family that they are not accustomed to people and become extremely flighty. Many householders prefer heavy-breed and crossbred pullets to the light breeds because of their quietness, but even they can become scary under poor management. Under good management light-breed birds may become so tame that they will jump or fly on to a person's shoulder. Having fowls quiet so that they can be picked up at will has much in its favour.

Any action which frightens fowls or makes them run about to escape capture is likely to put them off the lay. According to the time of year and the severity of the fright or chase, egg yield may be reduced for a few days or the birds may go into a partial or even a full moult and stop laying for 6 to 12 weeks. The "touchy" times are immediately after coming into lay; during winter, especially after a sudden change from fairly good to very bad weather and particularly for pullets which have been in lay for 4 or 5 months; and, for both pullets and hens, from about mid-November to mid-December. If egg production can be sustained until Christmas, fowls will usually maintain a consistent average yield until autumn, but a diminution of production in December is usually a bad sign. If the birds do stop laying temporarily, it is better that they should do so in November, because then they usually resume in January and continue well into autumn.

Catching Fowls

The chief considerations in catching a fowl are not to upset her and not to scare others of the flock. The way in which she is caught is much less important than doing it quickly without frightening the pen of birds. If, as is usual, the fowls are not tame enough to come to hand, the use of a catching device is better than chasing them around the house or yard until the wanted one is caught more or less by chance. The easiest device to make is a catching hook, but a net is more efficient. Both require some experience in use, but an owner who has learnt the knack would not revert to catching birds by hand.

A length of 2ft. 6in. to 3ft. is sufficient for a catching hook. If it is too long, it bends in the centre and makes catching more difficult. The hooking portion is narrow and only about 4in. long, with the end turned to a circle to prevent the fowl's body being jagged. The fowl is hooked by one leg near the foot, so that the spread of the toes prevents the foot from slipping through the head of the hook. Enough pull must be exerted to keep the leg outstretched. If the bird is prevented from kicking, she cannot release her leg. She should be dragged close to the catcher's feet before she is picked up. Sudden movements may cause the bird to be frightened, throw herself about strenuously, and escape.



Using a catching hook. The catcher hooks the bird by one leg and drags her close to his feet before stooping to pick her up.

Though learning the knack of using it requires more practice and patience, a net is better than a hook, which sometimes pierces the bird's skin and may cause a struggling fowl to break her own leg, especially if she hits an obstacle. The net is safe and efficient. The hook is easier to use when the fowl is running than when she is stationary, and, for a right-handed person, works best when the bird is moving from right to left; the hook is swept up behind the fowl and against the shanks, so that the leg moves into the head of the hook.

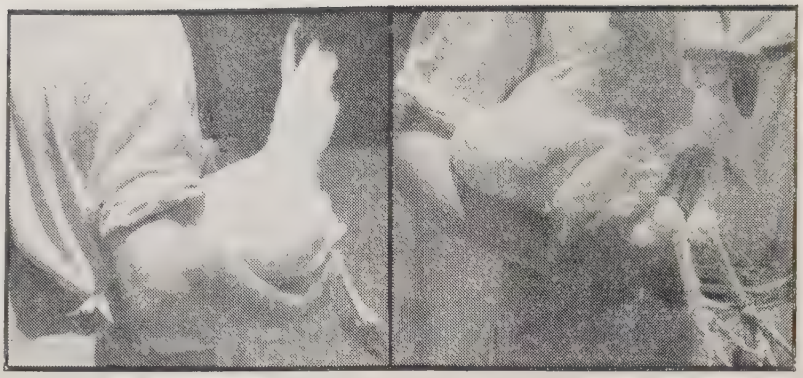
The net is equally useful whether the hen is standing still or running, facing toward or away from the net, moving toward or away from the catcher, running from right to left or the opposite, and on the ground or perch or even in flight. A long handle is unnecessary, but the bag must be deep enough to enmesh the bird.

Wire netting can be used instead of cord or netting twine, but because of the conspicuousness of such a net the birds are all the more alert to dodge it. If the fowl is standing still, the mouth of the net is brought smartly over her. If she is running, the open net is thrust just ahead of her so that her momentum carries her into it before she can change direction. The hen need not be pinned to the ground, as she can be lifted with a quick turn of the wrist.

The hook or net should be kept near the ground and not waved injudiciously or the whole penful of fowls will be scared. A wanted bird should be edged away from the mob before an attempt is made to catch her.

Another good catching device is a movable coop which can be placed in the run with its opening coinciding with that of the trapdoor; the wanted birds are driven out of the house into the coop. They are more willing to be driven from the inside toward the outside than the other way. The disadvantage of the catching coop is that the fowls get to know it and resist being driven into it.

If no catching implement is available, a bird may be caught with the hands if she is first driven to a corner away from the others.



A hen carried balanced on the palm of the hand with one or two fingers between the legs and her head tucked under the arm is comfortable and unlikely to be scared.

Holding Fowls

Housewives who treat their birds as pets do not like them to be roughly handled. That is an excellent principle, but some people with excess consideration for fowls have convinced themselves that certain ways of catching or holding them are cruel. Most breeds of birds are strong in limb, and the portion of the body by which they are caught does not matter provided they cannot struggle and cause themselves injury. A fowl is not harmed by being caught by the wings or legs, but as quickly as possible her body should be gripped between the hands and struggling prevented. What is suitable for one species is not necessarily correct with another. Fowls and turkeys should be caught and carried by the legs, ducks and geese by the neck. The former are strong in the legs and joints and weak in the neck; the latter are very weak in the leg joints but especially strong in the neck.

The hold on the bird should be modified according to the part gripped in catching. If a hen is lifted from the ground by a grip on one shank or the outer portion of a wing, that part should be held loosely so that no strain will be put on the joints if the bird struggles. If the part gripped is the thigh or the wing close to the body, it may be held tightly, as the joints there are stronger and a firm grip discourages the bird from struggling.

The bird should not continue to be held by one leg or one wing, the grip being changed so that she is held by both legs. For preference, in addition to being held by two legs, the bird may be tucked under one arm or cradled like a baby.

Carrying Fowls

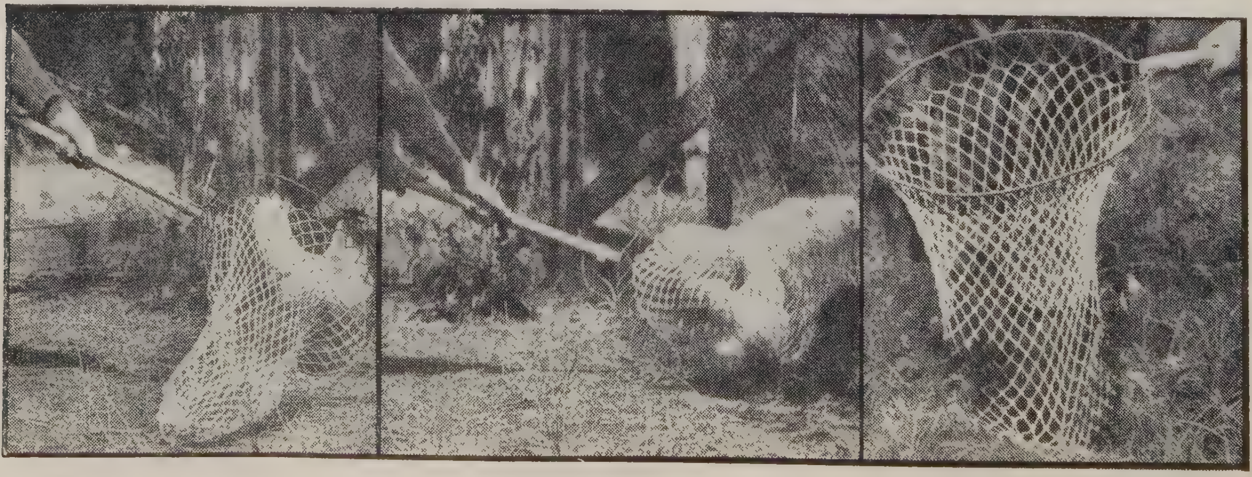
Carrying a fowl for a short distance by both legs with its head hanging down is not cruel, but if several hens are carried in one hand, too much pressure is exerted on the shanks. When two or three fowls are to be carried any distance all the legs may be held in one hand with the bodies cradled over the other arm, which is held in front of the chest. A single fowl may be balanced on the palm of the hand with one or two fingers between the legs and her head tucked under the arm; this prevents struggling and gives the hen confidence even if a moving object passes nearby.

If several fowls have to be moved, they are best placed in a box on a wheelbarrow.

All photographs by Fraser Niederer.

HOUSEHOLD POULTRY BULLETIN

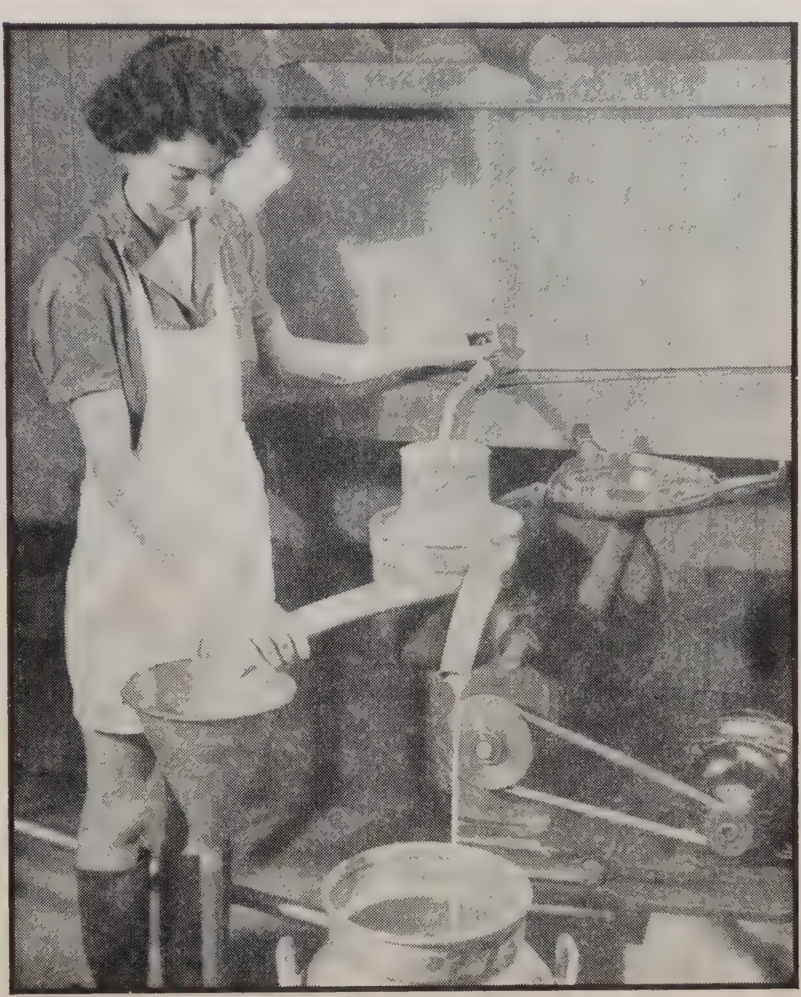
An up-to-date bulletin on domestic poultry keeping, written by W. L. McIver, who contributes the monthly articles on the subject in the "Journal", has been published. It describes the most modern methods which make for efficiency and labour saving. Bulletin 336, "Household Poultry Keeping", is obtainable free from the nearest office of the Department of Agriculture.



Using a catching net. When the bird is enmeshed in the net a quick turn of the wrist lifts her from the ground.

Operation and Care of Cream Separators

THE separation of cream from milk has for many years been carried out on New Zealand farms by a machine usually referred to as the separator. The cream separator has played an important part in building up New Zealand's great butter-making industry. In this article E. H. Penwarden, Farm Dairy Instructor, Department of Agriculture, Waitara, deals with the operation and care of a cream separator under ordinary farming conditions.



[National Publicity Studios photo.

IN the manufacture of butter it is essential that the fat in milk shall be concentrated in a comparatively small portion of the milk serum. This concentration of the fat carries with it a portion of all other constituents of the milk and the product is called cream.

Many years ago farmers separated cream from milk by the gravity method, in which the milk was placed in shallow pans and allowed to stand; the cream slowly rose to the surface and was skimmed off. In modern centrifugal machines almost the same principle is used as in the gravity method, the only difference being that in the centrifugal system the force which separates the cream from the milk is generated artificially and is exerted horizontally. With gravity, separation of the cream from the milk results from the difference in the specific gravity of the cream and the skimmed milk and the action is vertical. The force generated in a modern separator is several thousand times greater than the natural force in the gravity method, and this explains why cream separates almost instantaneously after the milk has entered the separator and is exposed to the centrifugal force.

The first attempt to separate cream with a machine was in 1864, when a separator as it was called was made with a series of small buckets hanging on the ends of arms connected to and swinging on an axis. After the machine had been whirled for an hour or so it was stopped and the cream skimmed off.

In 1877 a hollow bowl type of separator was made in both America and Germany. It was intermittent in action, as it did not have a continual inflow or discharge and was stopped at intervals to remove the cream and skimmed milk. In 1879 Laval in Sweden and Western in Denmark invented a separator with a hollow bowl into which milk flowed continuously and from which it was discharged through the cream and skimmed milk outlets. In 1890 it was discovered that contrivances such as discs in the bowl would increase the skimming efficiency. With improvements made during the last 60 years cream separators that are very efficient skimming machines have been evolved.

The main part of any modern separator is the bowl. As the milk enters it is delivered to the bottom of the bowl. The centrifugal force then separates the milk into thin vertical layers between the discs. The cream, the lightest portion of the milk, is forced toward the centre of the bowl, and the heavier portion, the skimmed milk, is thrown away from the centre. The incoming milk creates an upward pressure and forces the cream up the centre of the bowl and out the cream screw to the cream spout. The skimmed milk is forced up between the bowl cover and the special top disc and out through the skimmed milk outlet, which is provided in the bowl cover. Any dirt or slime, being heavier than either the cream or skimmed milk, falls to the bottom of the bowl into the sludge space provided.

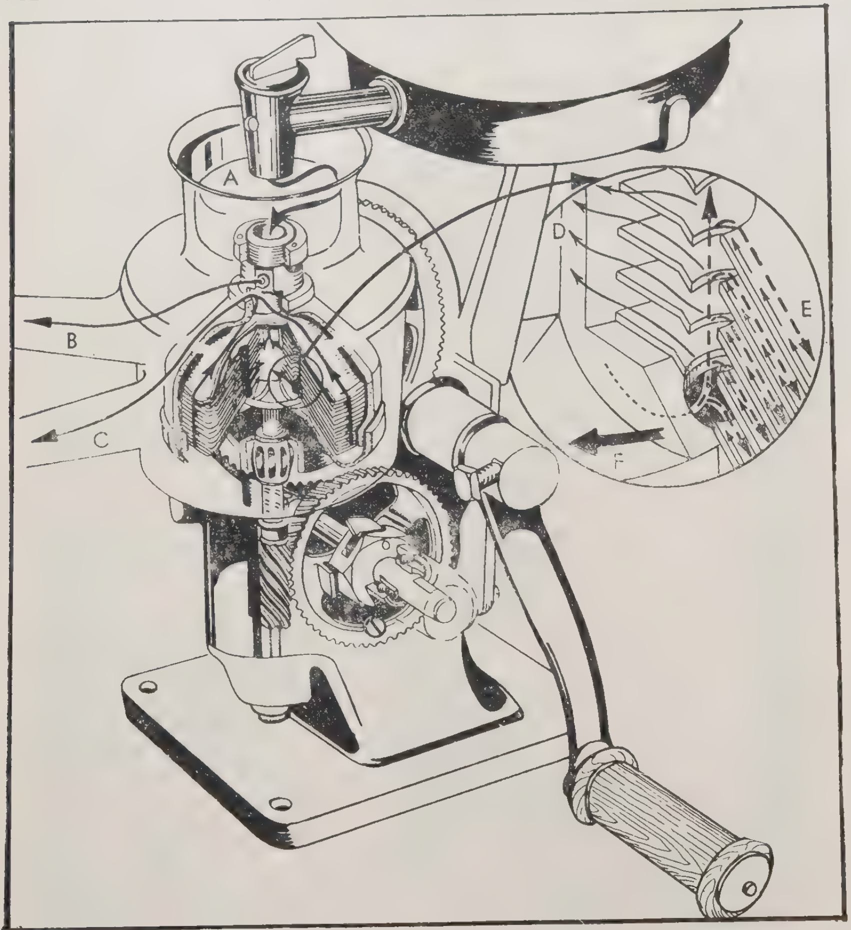
Condition of Milk

Milk for separation must be in as good physical condition as possible and must be free of all particles of dirt, hairs, etc., which will pass to the sludge space in the bowl and will clog up the bottom discs, thereby reducing the efficiency of the machine. Milk must be thoroughly strained before separating.

Temperature of the milk is most important and is one of the greatest causes of fat losses in skimmed milk. The correct temperature is 96 to 98 degrees F., at which the viscosity of the milk is at its lowest, enabling it to flow freely into the bowl. As the fat globules in milk quickly change their shape and properties with changes in temperature, milk should not be separated when it has cooled off; it must always be heated up to its correct temperature. However, it must not be heated too quickly, because the fat globules do not heat as quickly as the skimmed milk. It would be no advantage to heat cold milk quickly up to 98 degrees F. and separate it immediately, as excessive fat losses would be sure to result.

Control of Inflow of Milk

The control of the inflow of milk depends mainly on the size of the separator, temperature of milk, and pressure of milk in the vat. If the vat tap is not the correct size, the flow will be affected accordingly. If the feed is too fast, the milk will not remain in the bowl long enough for the centrifugal force to complete the separation; fat will therefore be lost in the skimmed milk, as the incoming



The construction and method of working of a cream separator. The course of cream and skimmed milk during operation is shown by arrows. The enlarged section of the part ringed in the main drawing shows the action by which the separated milk is forced outward on the undersides of the bowl plates. A—Float. B—Cream outlet. C—Skimmed milk outlet. D—Cream. E—Skimmed milk. F—Direction of high-speed rotation.

milk will force out the milk already passing through the disc before all the fat has been separated. Reducing the inflow to a very slow feed is not an advantage if the separator is running as it should; a slow feed will only leave the milk longer in the bowl than is necessary. This will result in a thicker cream, but the amount will be reduced, and running costs will be increased.

Speed of Separator

The separator must always be run at the speed indicated by the makers. Variations in speed may result from such causes as belt slipping, power shortage, or the pulley working loose on the shaft. Correct speed is most important, because any small variation in the speed has a great effect on increasing or decreasing the centrifugal force. This force varies according to the diameter of the bowl and the speed of the separator. If speed is too slow, extra fat losses will occur, and if it is too fast, there is risk of damage.

Thickness of Cream

Generally the thickness of cream is governed by turning the cream screw in toward the centre of the bowl (clockwise) for thicker cream and out from the centre (anti-clockwise) for thinner cream.

Flushing out the Bowl

Two reasons why flushing out the bowl is important are the effect it has on the butterfat test and the effect it can have on reducing the quality of cream. After separation the bowl should always be flushed out with skimmed milk caught in a clean dipper; about half a gallon is sufficient to wash out the cream adhering to the disc. Hot water should never be used, as it will cause the casein to harden and will also heat up the cream as it flows to the cream can, thereby assisting more rapid growth of bacteria, which in turn will cause the quality to be lowered. If too much skimmed milk is used for flushing and is allowed to flow into the cream can, the test of cream is lowered.

Variations in Cream Test

There are many reasons why the fat test of cream from one separator will show variations. A separator cannot be set to skim at, say, 40 per cent. cream test, because the separator will deliver, say, 40 per cent. of the milk in the vat through the cream outlet and 60 per cent. through the skimmed milk outlet regardless of the test of the milk in the vat. If the test of the milk in one separation is, say, 4.8 per cent. and in the next separation 3.6 per cent., the cream test must vary accordingly.

Further fluctuation may be affected by one or more of the following conditions:—

Sudden change in atmospheric temperatures.

Change of pastures.

Dogging, overdriving, ill treating, and overcrowding of cows.

Cows in heat causing excitement in herd.

Change of milkers.

Shortage of drinking water or variation of feed, especially when hand feeding.

Culling poor cows and replacing with good ones.

Drying off strippers and getting in newly calved cows.

Milking at irregular periods.

Neglecting to strip cows thoroughly when in haste to attend to other duties.

Lack of attention necessary to keep the separator running smoothly and free from vibration, resulting in irregular flow of cream and undue loss in skimmed milk.

Setting up and Care of Separator

A cream separator must always run smoothly. If the machine is running badly and vibrating, it is unsafe and there will not be efficient separation of the fat.

Care must be taken when setting up a separator to ensure that the machine rests firmly on its stand or block and that it is level. This can be checked by placing a spirit level on the upper rim of the frame. A bowl may jump out of an unsteady separator running at high speed. The bowl must be handled with great care. If it has been dropped at any time, it should be rebalanced; otherwise vibrations may set up which will interfere with the thin layers of milk between the discs and cause the cream and skimmed milk to become mixed, which increases losses. The bowl must be at its correct height in the frame. Height is usually regulated by a bottom screw which should be checked from time to time.

The separator must be thoroughly washed after each separation, the procedure being as follows: Remove cream and skimmed milk spouts; take the bowl from the frame and open it up; remove slime from the bowl; spread the discs out and flush them with cold water to remove slime. Wash all parts of the bowl and tinware, using hot water to which washing soda or a soap solution has been added. After washing the parts place them all in boiling water to sterilise them. They should then be placed out in the fresh air to allow them to drain and dry out. Wash the frame and base plate of the separator and afterward dry it with a cloth. This will prevent milk acids from affecting the paintwork and improve the general appearance of the machine.

The instruction book the manufacturer supplies with a new separator should be carefully studied and the directions in it followed. With proper care and under ordinary farm conditions any good make of cream separator should give years of efficient service.

HEADING PHOTOGRAPH: Portion of the experimental area on the Pisa flats, showing the good cover of blue wheatgrass.

Regrassing Experiments on Depleted Country in Central Otago

By W. A. LUNN, Fields Instructor, Department of Agriculture, Alexandra

IT has been estimated that natural tussock grassland comprises about 70 per cent. of the 21,000,000 acres under occupation in Marlborough, Canterbury, and Otago. After burning and relatively heavy stocking in the early days there was a decided drop in the carrying capacity of this country and in parts the land has become almost completely denuded. This article deals with experiments carried out by the Department of Agriculture on depleted, scabweed-covered country in Central Otago. The object is to improve its carrying capacity by the selection of plants most likely to succeed on this type of country and by ascertaining the best methods of establishing and managing these plants.

THE country on which these experiments are being carried out is in Vincent County, which is dominantly tussock, about 20 per cent. of which is depleted. This depleted land ranges from the terraces on the Pisa flats at an altitude of about 700ft. to an altitude of approximately 3000ft. on the lower and driest slopes of the Dunstan mountains. The average carrying capacity of this land is now approximately 1 sheep to 8 to 10 acres. Feed is scanty, and in many places the final stage of depletion, where scabweed is the only cover, has been reached.

Factors which Retard Regeneration

In parts, burning, followed by overstocking with sheep and denudation by rabbits, has been the main cause of depletion. Grazing alone has in many instances gradually destroyed the tussock. In addition to the many thousands of sheep running on these hills there is a healthy goat colony of some thousands, and these, aided by the seed-eating game birds chukor and quail, which have increased in recent years, contribute toward the retarding of regeneration. Allied with these effects is the fact that this country lies within the 14 to 20in. annual rainfall belt.

The area was originally fairly well covered with a vegetation which had been evolved in the absence of grazing animals. Various tussocks, including the fescue or hard tussock (*Festuca novae-zelandiae*), the small blue tussock (*Poa colensoi*), blue wheatgrass (*Agropyron scabrum*), and silver tussock (*Poa caespitosa*) still persist and continue to flourish on some roadsides and places not accessible to grazing animals.

In any experiment where regeneration is attempted the first requirement is adequate fencing to prevent all grazing, and a constant checking of fences and rabbiting of the area is necessary to keep the rabbit population down to a minimum. However, there are many problems besides overstocking to be overcome. The most important is the possibility of poor establishment due to the dry conditions of the seed-bed at sowing, followed by losses of young plants subjected to extremes of climate such as the burning sun and desiccating winds of summer and the heavy and prolonged winter frosts.

One of the principal aims therefore in addition to keeping the area free from stock is to establish not only plants palatable to stock but vigorously growing plants which will provide cover to retain moisture and shade and so afford some protection to the more useful plants, especially in the early stages of their growth.

As the removal of tussock and other tall growth by burning followed by overstocking is the first step toward depletion, it follows that replacement of the tall moisture-conserving growth is the first step toward regeneration.

Plots at Northburn Station

The first of the three main experiments dealing with regeneration is a series of 13 plots which were sown by Dr. L. Cockayne in 1920 at an altitude ranging from 1000 to 3000ft. and on sites varying from stony, depleted ground to dark faces with good soil. Two of the plots were sited to enclose different aspects and soil types within the one fence.

The following species were sown at different times in 1920 and 1921 during late autumn, early spring, and early autumn:—

May, 1920: Chewings fescue, cocksfoot, crested dogstail, danthonia, *Poa pratensis*, tall fescue, *Lotus angustissimus*, and browntop.

September, 1920: Chewings fescue, cocksfoot, crested dogstail, chicory, danthonia, lucerne, *Poa pratensis*, tall fescue, yarrow, browntop, and *Lotus angustissimus*.

March, 1921: Catsear, chewings fescue, chicory, tall oatgrass, cocksfoot,

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danthonia, lucerne, *Poa pratensis*, ribgrass, ryegrass, yarrow, Yorkshire fog, sheep's burnet, and subterranean clover.

Conditions during December, 1920, and January, February, and March, 1921, were severe, there being only three showers of any value during the 4 months and shade temperatures up to 96 degrees F.

After 15 months chewings fescue, chicory, cocksfoot, and lucerne, tall fescue, and yarrow became established, but perennial ryegrass, sheep's burnet, and subterranean clover, although germinated, could not be considered to be satisfactory. Crested dogstail, catsear, danthonia, *Poa pratensis*, ribgrass, and browntop all gave poor results.

After 2 years the conclusions reached were that spelling for that time would be of little benefit unless there was already considerable cover of living tussock which could be kept free from any stock.

Plots were all opened for grazing by sheep and rabbits from time to time, and in the summer of 1936 the outstanding feature of the plots was the growth of tall oatgrass, yarrow, and browntop. Grazing during winter was continued until 1945, and the following species were observed to be making fairly good growth in November, 1946, the plots having been closed then for the winter: Zig-zag clover, *Poa pratensis*, chewings fescue, tall oatgrass, sheep's burnet, and yarrow, with some cocksfoot and lucerne.

Position in 1950

Early in 1950 the outstanding feature of the plots was the growth of tall oatgrass on most of the plots situated on dark faces where there is a fair depth of soil. Elsewhere prominent species were sweet vernal, cocksfoot, chewings fescue, yarrow, sheep's burnet, *Poa colensoi*, and some danthonia and plume grass. These species are the most promising in this experiment.

Zig-zag Clover

One plant of zig-zag clover has been split up and planted in several places. It has spread by underground runners, there being two patches some 15ft. across which have spread from odd plants, first mentioned specifically in a report dated December 10, 1935.

One of the plots on a shady face of the Northburn Station where tall oatgrass has survived for 30 years.

Summarised the main features of the plots are:—

1. The suppression, but not replacement, of other species by tall oatgrass on shady faces.

2. The excellent ground cover produced by a *Poa pratensis*-yarrow association, particularly on plots with some protection from the prevailing winds.

3. The growth and spread of sheep's burnet on sunny faces.

4. The regeneration of *Poa colensoi* on sunny faces where plants were already in existence when the plots were enclosed.

5. The winter greenness, except after continuous heavy frosts, of chewings fescue, and, to a less extent, of danthonia.

Rocky outcrops are favourable for the breeding of rabbits.

Pisa Experimental Area

To follow up the work carried out on Northburn Station the Pisa experimental area (near Lowburn) was established in 1938 for the purpose of studying the behaviour of various indigenous and exotic pasture plants under the typical, hard climatic conditions and under grazing by sheep. This area is situated on the bare, exposed flats which lie between the foothills and the Clutha River above Cromwell. The soil is a medium schisty loam overlying shingle. There is much bare ground and little cover except that provided by scabweed and hairgrass.

Criticism has been made of the results achieved on the Pisa area on the grounds that it lies in a hollow and collects moisture, but before being sown the area was as bare as the surrounding country.

There are 4 separate fields in the area and a nursery block, and a smaller area, 2 chains square, has been closed up entirely to allow natural revegetation and to observe the effect of spelling alone on this type of country.

Field 1

Field 1 was sown by hand in April, 1938, the area being cultivated and harrowed before sowing and chain harrowed and rolled after sowing. The soil was dry at time of sowing.

Strips ½ chain wide were sown with seedings per acre as follows:—

Plot

1. Sowings of a mixture of species used in plots 2 to 10 below.
2. Mt. Barker subterranean clover, 5lb.
3. Lucerne, 5lb.
4. *Lotus hispidus*, 3lb.
5. No sowing.
6. Broad red clover, Montgomery red clover, and white clover, 2lb. of each.
7. White clover, 3lb.
8. Cocksfoot, 10lb.; white clover, 3lb.
9. Cocksfoot, 10lb; *Poa pratensis*, 5lb.; white clover, 3lb.

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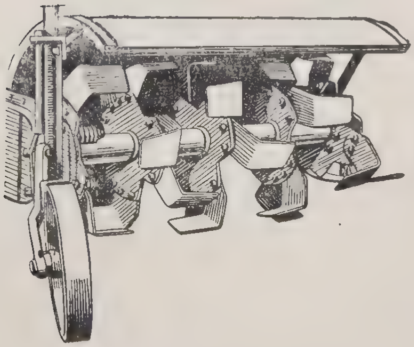

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10. Cocksfoot, 10lb.; *Poa pratensis*, 5lb.; white clover, 2lb.; and yarrow and sheep's burnet, 3lb. of each.

These sowings, with the exception of plot 1, were cross-sown with tall oatgrass at 20lb. and 40lb. per acre, crested wheatgrass, 30lb., and a fourth sowing of mixed tussock seed. By November, 1938, the mixed tussock grasses had grown very little, blue wheatgrass being most prominent. Crested wheatgrass was poor, but tall oatgrass was providing a good cover of robust plants. Subterranean clover had grown well. Broad red and Montgomery red clovers and white clover had produced healthy plants 2 to 4in. high, and cocksfoot had grown up to 4in. in height. *Poa pratensis* was only fair, being about 1in. high; *Lotus hispidus* was very poor.

By February, 1939, after a hot, dry summer, the native tussocks and crested wheatgrass were poor and disappointing, but the tall oatgrass had formed a good sward and had seeded freely. Mt. Barker subterranean clover, although dried up, had seeded well and the lucerne was still green and was well established. By the following November all species except *Lotus hispidus* were showing up well, although among the mixed tussocks blue wheatgrass was the only promising species. The crested wheatgrass was poor.

The outstanding features of field 1 early in 1950 were:—

The ground cover consisting of *Poa pratensis* and yarrow.

The exclusion of other species by lucerne. This results in much bare ground when the lucerne gradually dies out, usually after about 10 years.

The growth and spread by seed of blue wheatgrass. When they have attained a certain height and density these tussocks suppress the growth of other species and the intervening ground cover is often provided by hairgrass alone.

The clumpy tussock form assumed by cocksfoot and tall oatgrass, with a reduction of other species and an increase in bare ground.

The spread and growth of sheep's burnet, especially in an area which is protected from stock.

The dense, vigorous patches of white clover (where moisture can collect) and the wide spread of red clover over the field.

Field 2

Field 2 was sown in April, 1939, in dry, sunny weather, with the soil in a dry condition. The area was roughly cultivated, harrowed, hand sown, and harrowed after seeding.

The species sown and seedings per acre were as follows:—

Plot
1. Native species, *Agropyron intermedium*, and *Festuca mairei*.
2. *Poa pratensis*, 20lb.
3. Tall fescue, 20lb.
4. *Phalaris tuberosa*, 20lb.
5. Crested dogstail, 12lb.
6. Cocksfoot, 20lb.
7. Lucerne, 20lb.
8. Crested wheatgrass, 10lb.
9. Chewings fescue, 12lb.
10. Certified ryegrass, 20lb; white clover, 8lb.
11. *Danthonia pilosa*, 12lb.
12. Browntop (dryland), 12lb.
13. Browntop (ordinary), 12lb.
14. No sowing.

Extremes of climate hinder seriously the regrassing of depleted country in Central Otago. Winters are sufficiently severe to cause icing such as that shown above, where the surface of the dam is used for skating. On the other hand, summers are very hot, with the result that areas such as that in the background of the illustration, which are common throughout Central Otago, are almost denuded.

The plots were cross-sown with subterranean clover at 7lb. per acre, tall oatgrass, 27lb., and a combination of subterranean clover, 7lb., and tall oatgrass, 27lb.

Due to the dry autumn there was little germination until the following spring, when seedlings of all the species sown were present. Aided by a cooler summer than usual all species except *Danthonia pilosa*, *Poa pratensis*, and native tussocks established well, the best being lucerne, cocksfoot, ryegrass and white clover, tall oatgrass, and tall fescue, in that order. By autumn hairgrass had grown considerably and there was roughage 6 to 8in. high and in spring the same species were doing well, except that the lucerne had deteriorated and the *Phalaris tuberosa* had improved.

The main points from field 2 were:—

The patchy distribution and poor growth of both types of browntop.

The clumpy nature of chewings fescue, danthonia, and tall oatgrass, with much bare ground between plants. Cocksfoot has a similar growth habit and was showing signs of dying out.

Phalaris tuberosa was holding on well, but few seedlings could be found. This species produces a fair amount of winter feed irrespective of summer and autumn weather.

The good growth and spread by seed of blue wheatgrass.

The small patches, with varying growth, of white and red clovers and, to a less extent, of subterranean clover. Vigour and growth depend on prevailing weather.

Field 3

Field 3 was sown in March, 1940, in dry weather on the same system as the other fields.

The species sown and seedlings per acre were as follows:—

Plot
1. Tall oatgrass and crested wheatgrass, 10lb. of each for 2 chains; the rest, no sowing.
2. Browntop, 7lb.
3. *Danthonia pilosa*, 10lb.
4. Certified ryegrass, 7lb.; white clover, 3lb.
5. Chewings fescue, 6lb.
6. Crested wheatgrass, 10lb.
7. Meadow fescue, 10lb.
8. Cocksfoot, 8lb.
9. No sowing. . .
10. Crested dogstail, 6lb.
11. *Phalaris tuberosa*, 10lb.
12. Tall fescue, 15lb.
13. *Poa pratensis*, 10lb.
14. Mixed tussock species.

These 14 plots were cross-sown with subterranean clover at 4lb. per acre, lucerne, 5lb., and with a general seeds mixture.

A fairly good strike was obtained, but growth was poor in autumn and the area looked unimpressive. In the spring and summer of 1940, which were dry, no improvement had been made. By the following spring, which was again dry, the sward was poor, though most of the species could be found.

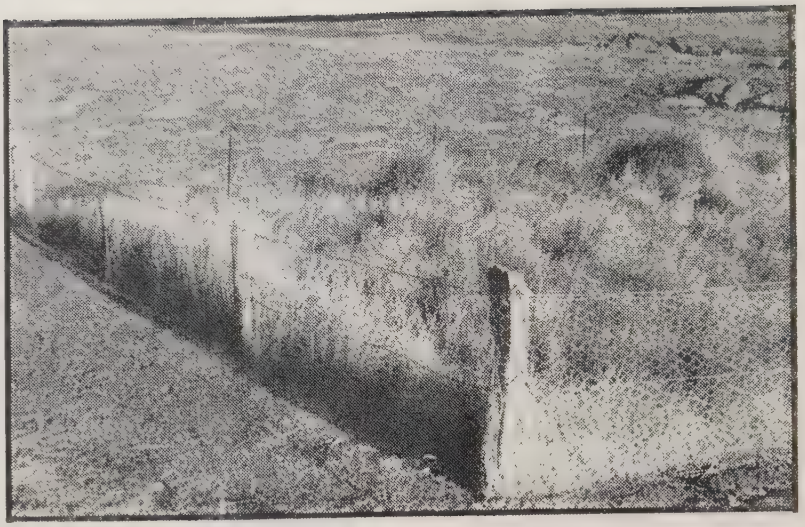
Good growth followed in autumn, 1941, although the area was patchy and there had been considerable growth of hairgrass and mignonette (*Reseda luteola*). By autumn of 1942 the best of the sown species were tall oatgrass, cocksfoot, tall fescue, chewings fescue, and blue wheatgrass, with *Poa pratensis*, crested wheatgrass, white clover, and lucerne good in patches.

From field 3 the main points were:—

The good growth of and fair ground cover from danthonia.

The clumpy nature but healthy appearance of chewings fescue.

The vigour and production of *Phalaris tuberosa* and tall fescue where these have some protection from a plantation.



Small plot on the depleted country growing an introduced grass as the result of rabbits being fenced out.

- The production and ground cover afforded by the *Poa pratensis*-white clover-subterranean clover association.
- The unthrifty appearance of many of the lucerne plants.

Field 4

Field 4 was hand sown in March, 1945, with a general mixture and not in blocks as in the previous sowings. The soil at the time was moist and the area was tandem disced before and after sowing.

Seeding was at the rate of 18½lb. per acre, the species and rates of each per acre being:—

	lb.		lb.
Lucerne ..	1	Danthonia ..	1
Yarrow ..	½	*Poa pratensis*	2
Subterranean clover ..	1	Tall oatgrass ..	1
		Seed offals ..	12

By autumn, 1946, which was dry, the lucerne was well established and had set seed; tall oatgrass, yarrow, cocksfoot, and *Poa pratensis* had established fairly well and there was a heavy growth of hairgrass.

Features of field 4 in early 1950 were:—

- The predominance of lucerne, through which were dispersed a few small plants of cocksfoot and tall oatgrass. For run winter country lucerne is of little value, though it grows well in spring and early summer, shading out other species; in winter it is reduced to stalks of little value for grazing.
- Where the lucerne cover was not too dense yarrow and *Poa pratensis* had grown well and were spreading slowly.

Grazing

In the early years of the trial no set programme of grazing was followed, the fields being grazed whenever growth was sufficient or whenever there was roughage to be cleaned up, the numbers of sheep varying. Typical of the grazing programme is the following:—

On May 1, 1942, 20 ewes were given access to fields 1, 2, and 3. They lambed in September and the ewes and lambs were taken off on November 1, the ewes after 184 days. There was at the time a fair amount of tall growth (up to 18in. high) of lucerne, tall oatgrass, *Phalaris tuberosa*, and tall fescue and a fair covering of all the other sown species. Broad red clover and Montgomery red clover were eaten first, but after a time the whole area was well grazed down and all growth was controlled. A short, wet spring and an early summer were experienced, and by January 1, 1943, red clover had practically disappeared. Subterranean and white clover had been checked, but both were coming away. Lucerne, cocksfoot, *Poa pratensis*, yarrow, blue wheatgrass, and tall oatgrass all made a good recovery. Crested wheatgrass, although it had recovered, had little growth.

After field 4 was established it was opened to grazing at intervals with the others, and sheep showed a preference for this field, which was dominantly lucerne.

The area is treated at present as typical run winter country and 12 to 15 ewes are put on it in May-June and removed in November. Under this stocking there has been more than enough feed available; after a good autumn double the number of ewes could easily be carried. This treatment allows the plants to reseed freely during summer and autumn.

A corner of field 1 which was originally sown down as a subterranean clover trial and with a general mixture of seeds is now dominantly *Brachypodium phoenicoides*, which spread from an adjoining nursery area partly by seeding and partly by underground rhizomes. Although this species has formed a dense cover, it is unpalatable and sheep even when forced on to it have not remained there any longer than they were compelled to.

In all, some 320 plant introductions have been raised in the nursery area in addition to 138 selections of tall fescue seed harvested in different parts of New Zealand.

Kane's Block

As a result of information secured from the Northburn plots and the Pisa experimental area it was proposed that a larger area be sown out with the most promising species, and accordingly an area of 100 acres of hill country was selected on the property of Mr. D. Kane, near Hawea.

This area is situated mainly on a spur the end of which has a northerly aspect and sunny faces. There are half-dark and dark faces on the main slope, which has both westerly and southerly aspects. It is fairly steep. The cover is principally scabweed with some hard-grazed *Poa colensoi* and fescue tussock on the shady faces on the topmost portion.

Of the 100 acres approximately 50 were sown out in March, 1949, with different seed mixtures. The seed was broadcast by hand and the soil at the time was moist to wet after several heavy falls of rain.

The mixtures sown consisted of those plants which over the years had proved to be most promising for the various aspects and soil conditions. These species included tall oatgrass, lucerne, and danthonia for the hard, dry, and exposed areas. On the slightly better country tall oatgrass, lucerne, danthonia, sheep's burnet, yarrow, *Phalaris tuberosa*, blue wheatgrass, cocksfoot, and tall fescue were sown. On the better southerly face sowings were made with tall oatgrass, browntop, sweet vernal, subterranean clover, cocksfoot, sheep's burnet, and *Phalaris tuberosa*. In addition a number of small-scale sowings were made and included the following additional species: *Brachypodium phoenicoides*, perennial veldt grass, and crested wheatgrass.

A vigorous rabbiting programme has been followed throughout winter, poison and, for the large warrens, ferrets being used. Though a number of rabbits remain in the rocks and bracken fern, there are now not enough to do serious damage. The large numbers which moved on to the block shortly after the seed struck would have ruined the experiment had they not been eradicated. Rabbits in their efforts to reach the feed on the area have been seen to scramble up the netting and drop down on the other side.

A long-term policy must be the aim and several years will probably elapse before any stocking will be carried out on this block. Meanwhile rabbit numbers must be kept to the minimum. When a fair cover has been obtained careful stocking will be carried out under various systems of grazing and spelling. Species proved to be of value on this country must be maintained and increased by natural reseeding following periodic spelling.

The ultimate aim of a great deal of this work, especially as it applies to Central Otago, is for the Department of Agriculture to be able, when and if the rabbit population is considerably reduced, to offer sound advice on how regeneration work should be done.

There are still several questions to be answered, such as what is the best seed to sow, the best time to sow, the best method of sowing, and type of management after establishment on a farm scale. Although a good deal of information has already been accumulated, results have been obtained mainly from small-scale plots and have yet to be proved to apply equally in the farming of larger areas.

The Home Garden in December

By H. P. THOMAS, Vegetable Instructor, Department of Agriculture, Wanganui

DECEMBER is not only a busy month for general maintenance and further successional sowings and plantings for late-summer and autumn harvesting, but is an important one for planning and making some very necessary sowings and plantings for winter. The need for planning ahead has been emphasised in previous home garden articles. Provision made now will ensure that the family's vegetable needs are met during winter and the lean period from August to November. Sowings and plantings recommended must be fitted in regardless of holidays if the full benefits are to be reaped later.

[*Sparrow Industrial Pictures Ltd. photo.*

Constant attention should be given to pruning, tying, liquid manuring, and spraying to get the best results from tomatoes.

IF sowings of winter-maturing crops were not made last month, a choice of the following should be sown immediately: Savoy cabbage, broccoli (sprouting and early and late varieties), brussels sprouts, celery, leeks, red cabbage, and borecole (curly kale). A further sowing for successional plantings may also be made toward the end of the month. Initial plantings of winter greens, raised from an earlier sowing or purchased from a seedsman, may now be planted out in well-manured soil that contains adequate moisture. For southern districts December, January, and February are the preferred months for planting winter greens, but in the North Island, where conditions are milder, the planting period can be extended to April if early-maturing kinds are chosen.

Successional sowings of dwarf beans, peas, carrots, beet, lettuce, radishes, turnips, spring onions, mustard, cress, and, in some districts, sweet corn, parsnip, and swedes should be continued. Parsnips may be sown, although December is rather late for sowing in southern districts unless the quick-maturing Oxheart variety is tried.

REMINDERS FOR DECEMBER

Plant: *Artichokes (Jerusalem), †broccoli, †brussels sprouts, †borecole, †cauliflower (autumn and winter), cabbage (autumn), *cucumber, celery, celeriac, *kumaras, †leeks, *marrows, *potatoes (preferably early varieties), *pumpkins, spinach beet, silver beet, †savoy cabbage, *tomatoes.

* Without delay.

† Initial plantings.

Sow: *Brussels sprouts, *broccoli, *broccoli (sprouting), beetroot, beans (dwarf), *borecole, cress, *celery (for late planting), carrots, cauliflower, cabbage (Succession), *cabbage (red or pickling), *leeks, lettuce, mustard, onions (spring), parsley, *parsnips, peas, radish, spinach (summer and New Zealand), silver beet, sweet corn, *savoy cabbage (main and late), *salsify, swedes, turnips.

* If these vegetables were not sown in November, they should be sown immediately.

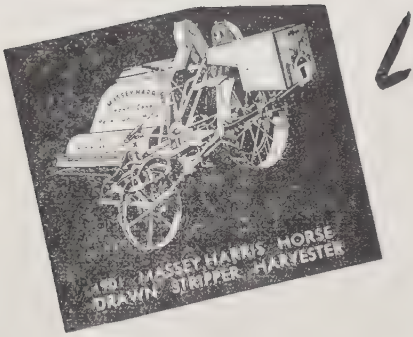
[*Sparrow Industrial Pictures Ltd. photo.*

Sowings of carrots, parsnips, beetroot, etc., should be thinned as soon as the plants are large enough to handle. It may be advisable in summer to water the plants after thinning to consolidate the loose soil around their roots.

Earlier sowings of carrots, parsnips, beetroot, spring onions, silver beet, and lettuce should be thinned before the plants become too large. After thinning it would be advisable to water the plants to consolidate the loose soil around their roots.

Unless the soil is dry, robust plants of silver beet, spinach beet, and lettuce may be transplanted. Trenches or beds for celery and leeks should be prepared and plants set out this month.

Sturdy plants of cucumber, marrow, pumpkin, tomato, and kumara, and seed of an early variety of potatoes should be planted out without delay, if requirements are not already fully provided for.



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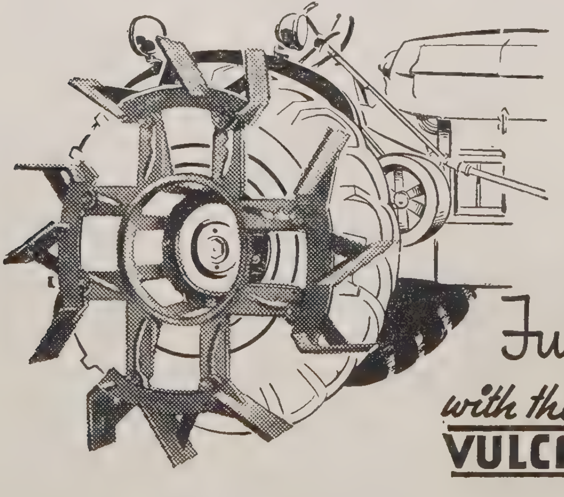

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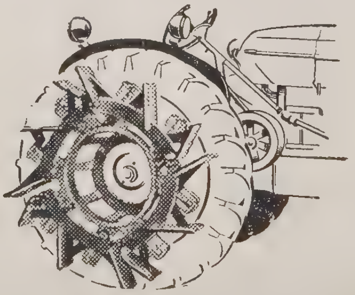

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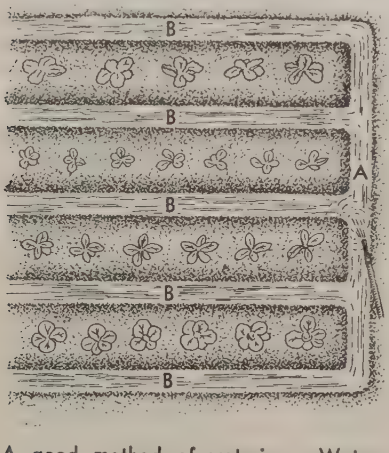
that reason hoeing should be done regularly whenever the state of the ground permits. A surface mulch loses its effectiveness fairly quickly, particularly after rain. Surface cultivation helps to aerate and warm the surface layers, but its primary object is the suppression of weeds which, if left for long, will rob the cultivated plants of much plant food and moisture.

Spraying

With the advent of warmer weather the home gardener must again take early precautionary measures against pests and diseases which are likely to damage crops. Where insect pests such as the white butterfly, diamond-backed moth, and vegetable weevil are likely to be troublesome applications of D.D.T. 2 per cent. dust every 2 weeks or D.D.T. 50 per cent. wettable powder (½oz. in 4 gallons of water) every 2 or 3 weeks will give satisfactory control. Against aphides (plant lice), often encountered on broad and runner beans, nicotine sulphate, 1 fl. oz. (7 teaspoons) in 4 gallons of water to which 2oz. of soft soap or soap powder has been added, should be used.

Where the carrot rust fly is troublesome horticultural naphthalene, which acts as a deterrent to the egg-laying fly, should be broadcast over the area at the rate of 1oz. to the square yard every 14 to 21 days. Applications should cease at least 2 weeks before the carrots are to be used; if the repellant is used up to a later stage there may be some residual taint of naphthalene on carrots after they have been cooked. Another method which has been successful and is worth a trial is to water the carrot rows every 4 weeks with a solution of D.D.T. 50 per cent. wettable powder (½oz. to 4 gallons of water). The solution should be applied over the carrot foliage with a watering can with a fairly fine rose and should penetrate 3 to 4in. of the soil. Applications should be made as soon as the plants have reached the true-leaf stage, but should cease when plants have grown to a usable size.

For the prevention of celery leaf spot, late blight of tomatoes and potatoes, and downy mildew of onions, plants should be sprayed at 10- to 12-day intervals with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water) or with copper oxychloride (3oz. to 4 gallons of water).



A good method of watering. Water is delivered from a hose into a side drill (A), from which it runs into drills (B) between the plant rows.

Planting and Manuring

From December until April it is an advantage to sow or plant all vegetables on the flat, as this facilitates watering and liquid manuring during the warmer months.

Liquid manure may be applied with advantage to most crops, particularly at this time of the year; it may be prepared with most animal or poultry manure, and it is the ideal way of supplying growing plants with the stimulants they need. A quantity of manure and, if it is available, some soot should be put into a sugar sack (or piece of open-textured sacking) and suspended in a drum or barrel of water and left for approximately a week. The resultant liquid should be broken down to the colour of weak tea (about 1 part to 4 parts of water) before being used. Where animal manure is not available nitrate of soda or sulphate of ammonia at 1 to 2oz. to 4 gallons of water may be used. If the ground is dry, it is advisable to water it before applying the liquid manure.

Watering

Suitably spaced, moderate falls of rain unfortunately cannot be expected during summer; therefore at times attention will have to be given to watering, particularly with crops such as beans, peas, celery, lettuce, radishes, and cucurbits. Watering is often one of the less satisfactory methods of overcoming drought conditions, but when it is undertaken it should be done thoroughly. Too often when a hose or watering can is used the surface of the soil only is dampened. This has the effect of bringing roots to the surface in search of moisture, and because of the high day temperatures common in summer, plants receive a serious check.

A good method of watering is to draw shallow drills along the plant rows and connect them with a drill along one side of the plot. Water is run from a hose into the side drill, from which it flows into the drills between the plant rows. The hose should be left on until the soil is thoroughly soaked.

It may be necessary sometimes to make holes with a fork along the drills to help the water to penetrate sufficiently.

If the ground is sloping, an effective system where the area is not too large and a fairly good supply of water is available is to embed field pipes or bottomless tins vertically in the ground and run water into them. In this way water will reach more suitable depth for plant roots. If only small tins are available, 2 tins may be placed one above the other. An alternative method is to make holes with a crowbar and to run water into them.

Interplanting

If during December the garden becomes almost filled with vegetables at various stages of growth, interplanting may be carried out successfully, provided that quick-maturing vegetables (such as lettuce, spinach, and radish) are planted between rows of vegetables (for example, celery and leeks) which have a fairly long season of growth.

[*Sparrow Industrial Pictures Ltd. photo.*
Scarlet runner beans grown on a pyramid of 3 stakes.

Sweet corn may be planted throughout cucumbers, melons, and pumpkins; and brussels sprouts, cabbages, and cauliflowers, or even root crops, may be planted between rows of maturing potatoes, peas, and beans. Interplanting also has the advantage of providing suitable shelter for some crops, particularly in very exposed gardens.

The harvesting of main-crop rhubarb should be discontinued, and the cutting of asparagus should cease by the end of November, or mid-December at the latest.

Potatoes should be kept well earthed up. Kumara plants will now be developing runners and these should be lifted occasionally to keep them from rooting at the nodes. Weeds should be kept down throughout the kumara planting and the moulding-up of the ridges maintained.

Constant attention must be given to pruning, tying, liquid manuring, and spraying of tomatoes. Stunted, unhealthy plants or plants with bronzy markings on the young, growing leaves should be removed to avoid spread of virus infection to nearby, healthy plants.

Care should be taken when cultivating lightly among established onions not to cover the bulbs; the aim should be to expose those which appear to be set too deeply. Care must be taken to avoid injuring the bulbs, as any damage will impair their keeping quality.

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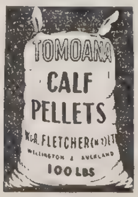

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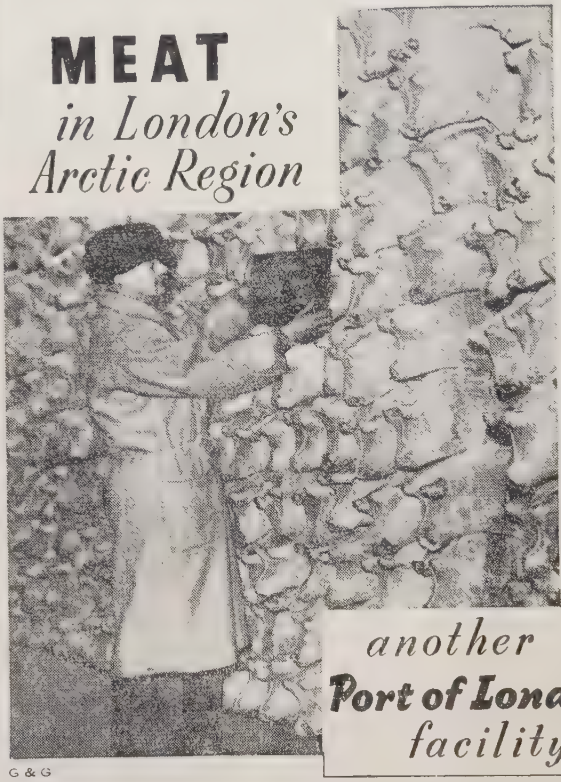

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Beans

Where possible shelter must be provided for broad and dwarf beans, as cold weather or extreme changes in temperature will adversely affect the pollination of the flowers and the subsequent setting of the crop. Even where pollination has been effected extremes in temperature later will often cause young pods to curl or hook and even to wither and die. Dryness at the roots is also a frequent cause of the non-setting of the flowers and it is partly for this reason that sandy soils containing little humus should be avoided unless a supply of moisture can be assured.

To promote good setting of the pods of broad beans plants may be stopped by pinching out the tops when plants are about 2½ to 3ft. high. The succulent tips removed may be cooked and eaten like spinach.

For the control of aphides, which make their attack on the terminal growths of most bean plants, nicotine sulphate, 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap or soap powder has been added, should be applied.

The pods of all varieties of beans should be picked before they become over-mature, as they are then more tender, and constant picking results in heavier production.

[*Photo News Ltd. photo.*

Beetroot is in fairly consistent demand throughout the year and in most gardens it is advisable to make several sowings of different types in succession from early spring onward.

Carrots

In districts where carrot rust fly or carrot aphis is troublesome it is usually difficult, unless special precautions are taken, to produce a good crop of quality roots if seed is sown before December or January. The sowing of intermediate or stump-rooted types now in areas not lacking moisture will give good-quality roots for winter use. Because young carrots are of much better quality than mature roots, successional sowings should be made in districts where they are likely to succeed.

If the soil to be sown in carrots has been heavily manured for a previous crop, no further manure will be necessary. However, soils deficient in organic manure should be dressed with equal parts of superphosphate and bonedust plus wood ashes at the rate of 4oz. per square yard. The mixture should be applied when the soil is being raked before sowing.

Soil for carrots should be worked down to a fine tilth and the seed sown ¼ to ½in. deep in rows 12 to 15in. apart. Where thinning is necessary plants should be thinned to 4 to 6in. apart.

[*Green and Hahn Photography Ltd. photo.*

Plantings of winter greens, such as brussels sprouts shown above, should be made during the next few months, as plantings made at this time will determine how well the garden is stocked in winter.

Varieties: Recommended varieties for December and January sowings are Early Krop, Chantenay, Manchester Table, and Nantes.

Celery

December and January are the preferred months for setting out celery plants, although they may be planted up to March in districts where autumn and winter conditions are fairly mild. For best results the celery crop should be grown rapidly and should never be permitted to become dry at the roots. For this reason the trench system of planting is advocated, as most of the moisture received, either from rainfall or watering, is more readily retained. The celery plant is a gross feeder and must be well supplied with moisture. It is advisable to incorporate a 4 to 6in. layer of well-rotted animal manure or compost in the bed or trench during its preparation. Just before planting, a fertiliser mixture consisting of equal parts of blood and bone and superphosphate plus 5 per cent. of sulphate or muriate of potash may be worked into the top 3in. of soil if organic manure is lacking.

Varieties: For December to January plantings White Plume and Gilt Edge Golden are recommended and for late-winter maturity Solid White.

Cauliflowers

Cauliflowers are comparatively delicate and a check which may have little effect on cabbages or even broccoli would be likely to cause cauliflowers to "button". Therefore, cauliflowers should be raised and transplanted with care. Sturdy plants should be set out early so that they will become firmly established before the colder autumn weather is experienced.

Seed should be sown thinly ¼ to ½in. deep in a well-drained, deeply cultivated soil of good humus content, and when the young plants are about 6 weeks old they should be lifted carefully and transplanted to soil similar to that of the seed-bed. Holes for plants should be watered before

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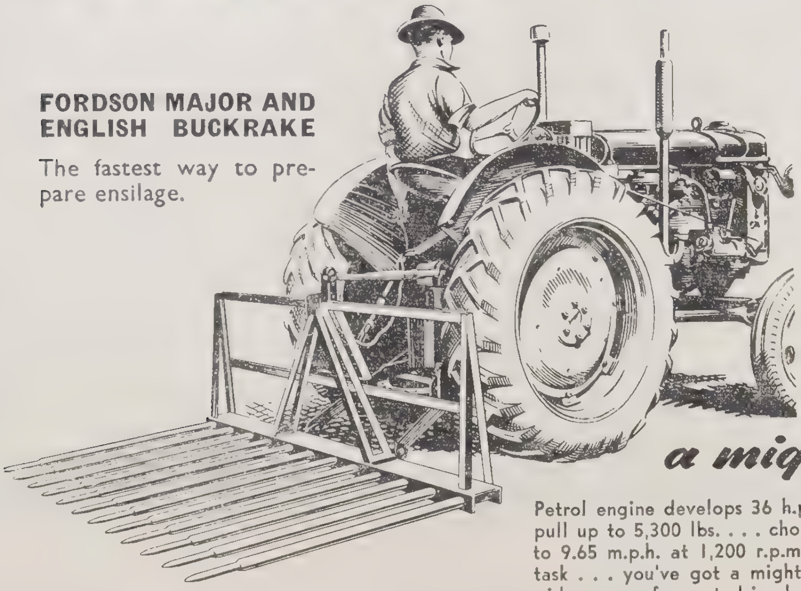

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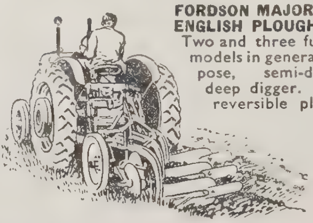

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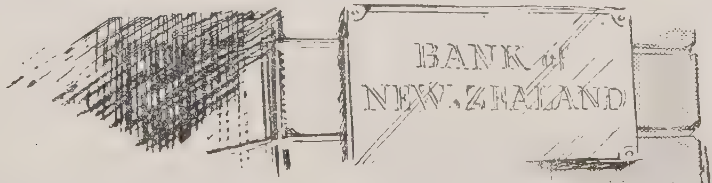

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plants are set in them and plants will also receive less check in hot, dry weather if a third is cut off the outer leaves to reduce transpiration from them.

Plants should be set out 18in. apart with 2ft. to 2ft. 6in. between rows.

Varieties: Walcheren, All Seasons, and Veitch's Self-protecting.

Winter Greens

The provision of winter crops is the real test of gardening ability. December and January are the correct months for setting out the principal winter greens such as savoy cabbage, broccoli, brussels sprouts, and borecole. Where these have not been raised from seed sown earlier plants may be obtained from seedsmen. Plants should be set out in a rich, deeply cultivated, well-drained soil, though brussels sprouts and broccoli prefer a firm soil. The incorporation of organic material such as well-rotted stable or farmyard manure, old stack bottom, or compost is desirable in most home garden soils. In addition a complete fertiliser (one containing nitrogen, phosphoric acid, and potash) should be applied at the rate of 4oz. per square yard. It is necessary to have this plant food thoroughly incorporated in the soil to prevent possible damage to the roots of plants and so that it will be evenly and gradually asssimilated throughout the growing period. Plants should be watered, particularly in the early months of their growth, if conditions are becoming dry. If plants have to be set out during dry weather, it is advisable to puddle the roots in thick muddy water as soon as plants are lifted and to cut off portion of the tops. Should planting be delayed, the roots of lifted plants should be kept moist, as the tops are then less likely to wilt.

There are many suitable varieties of vegetables classed as winter greens. Following is a selection, the approximate times of maturity from December plantings being given in parentheses:—

Savoy cabbage: Omskirk Early (March-May), Drumhead (May-July), and Omega (July-September).

Broccoli: Michaelmas Early White (March-May), Mammoth Winter White (June-July), Lily White No. 2 (August - September), and Late Queen (September-October).

Borecole: Dwarf Green and Tall Green Curled.

Brussels sprouts: Scrymger's Giant, Long Island Improved, and Giant Fillbasket.

Red or pickling cabbage: Red Dutch and Mammoth Rock Red.

Sprouting (non - heading) broccoli: Calabrese, Green Sprouting, and Purple Sprouting.

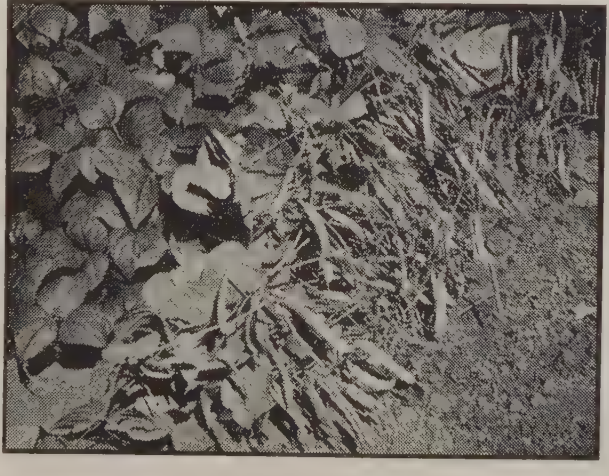
[*Green and Hahn Photography Ltd. photo.*

There should be a planting of silver beet in every garden. If plantings are well planned, they will provide supplies of a good standby for most of the year.

Leeks

Leek plants may be planted out from mid-December to the end of February, although December and January are the preferred months. To ensure a supply from mid-winter to spring it is advisable to make three plantings (early, mid-season, and late). Leeks are very easily grown and are rarely affected by insect pests or diseases, and, unlike most vegetables, they will stand for many months and can be used when required. Although leeks will tolerate a wide range of soil conditions, they are gross feeders and will respond well to liberal manuring and watering. The crop, together with other winter-maturing kinds, plays such an important part in the continuity of vegetable supplies that time spent on adequate preparation of the soil is amply repaid. For best results the soil should be enriched with well-decayed farmyard manure or compost plus a fertiliser mixture of equal parts of blood and bone and superphosphate and 5 per cent. of sulphate or muriate of potash. The fertiliser should be worked into the bed or trenches at the rate of 1lb. to 20ft. of row. Plants, from which it is usual to remove portion of the tops, may be planted 8 to 12in. apart in holes 5 to 6in. deep and 3 to 4in. across prepared with a blunt dibble. In light soils it is advisable to make the holes after a trench 3 to 4in. deep has been drawn out with a hoe. A plant is dropped into each hole so that its roots rest at the bottom and only the tips of the leaves protrude.

If plants are watered immediately, the holes will not need to be filled in, as the watering washes down sufficient soil to give them a start. Later holes will be filled up by the growth of the plants and by soil washed down by rain. Leeks may also be set out like celery in well-manured trenches approximately 1ft. deep and 15in. wide, with the plants spaced 1ft. apart.



[*Sparrow Industrial Pictures Ltd. photo.*

The pods of all varieties of peas and beans should be picked regularly.

Leeks should be cultivated frequently as development progresses and earthed up gradually. Care should be taken not to cover up the hearts of the plants. Plants will respond well to fortnightly applications of liquid manure.

Varieties: London Flag or Broad Flag (which is best grown for early use), Musselburgh (a hardy variety with a long, thick stem), and Lyon (similar to London Flag, but slower growing and larger; it is suitable for late crops and for exhibition).

Peas

The pods of peas should not be allowed to grow old on the vines; the harvesting period is lengthened if picking is done regularly. Peas can still be sown, particularly in the cooler parts of New

[*Green and Hahn Photography Ltd. photo.*

Swedes are usually grown for late-autumn or winter use. A sowing of them can be made in December.

Zealand. A cool, moist, well-drained loam of high humus content is best, and where these conditions still apply successive sowings should be made.

Where conditions are not as described the following method of sowing is worth a trial: Take out a trench 8 to 12in. deep, put in it 4 to 6in. of rotted manure or leaf mould, and top this off with garden soil to about 3in. below the surface of the surrounding soil. This system simplifies watering and ensures that moisture applied or rain goes to the roots. It is also advisable to mulch the plants as soon as they are beginning to grow well. Peas sown in the usual way in the warmer districts are often scorched by the sun or develop mildew.

The stronger-growing varieties of peas, such as Greenfeast, Stratagem, and Southern Cross (Onward), should be chosen for growing from December onward.

Parsnips

Sowings of parsnips may still be made in northern districts. Though roots are not usually lifted until after the first frosts, seed should be sown early enough to enable roots to attain full development before the onset of winter slows or stops growth. They take at least 5 months to mature. Parsnips will "stand" well during most of the winter if soil drainage is good.

Soils where parsnips are to be grown should be dressed with lime at 3 to 4oz. to the square yard if a dressing has not been applied recently.

Parsnips grow well in most soils, but a deeply cultivated, well-drained soil that has been liberally manured for a previous crop is best. Superphosphate at the rate of 2oz. per square yard and, if available, dry wood ashes broadcast over the ground and raked in, should be applied before the seed is sown. As the seed often germinates slowly, it should be sown fairly thickly ½in. deep in rows 18in. apart in soil that has been worked to a fine tilth.

A method which appears to have distinct advantages is to sow pinches of seeds at 4 to 6in. intervals and to thin each group of seedlings to one plant.

Where germination of parsnip seed has been unsatisfactory the following method is worth trying: **Open a drill about 3in. deep, fill it with leaf mould, firm the filling and sow the seed, and** then cover the seed with fine leaf mould. The drill should be kept fairly moist.

Seedlings from the usual type of sowing should be thinned to about 2in. apart when they are 2in. high, and later, when the roots have become a usable size for soups and stews, plants can be given a final thinning to 4 to 6in. apart.

Intermediate and stump- or turnip-rooted varieties which mature earlier than the long varieties are available, but they have never found such favour as have similar types of carrots and beetroot.

Varieties: Hollow Crown is popular; others are Student and Model.

Swedes

In the home garden swedes are usually grown for late-autumn and winter use. If a sowing was not made last month, they can be sown now or in January in northern districts. Even February is favoured in districts with a very mild climate. Swedes are essentially cool-weather vegetables, and moist conditions are necessary for good crops. They succeed in most soils, but do best on well-drained soil moderately rich in well-rotted organic matter which has been well worked in.

On most soils superphosphate at the rate of 1 to 2oz. per square yard should be applied.

Seed should be sown ½in. deep in rows 12 to 15in. apart and seedlings thinned to 6 to 8in. apart.

Varieties: Laing's Garden (medium), Superlative Table (tankard-shaped), and Rutabaga Purple Top (large).

Shallots

Shallots which were planted early may be reaching maturity and the ground they occupy may be wanted for winter greens soon. If this is so, maturity may be hastened considerably by discontinuing watering and by removing the soil from around the bulbs to expose their bases to air and sunlight to induce thorough ripening. When properly matured and dried shallots will keep well for about 9 months. They are very useful for sauces and pickles and for flavouring.

Spinach

The good nutritive value of spinach justifies a planting of this vegetable in all gardens. It is not difficult to grow, provided it is given moisture and a fairly rich soil. Spinach grows quickly, maturing under favourable conditions in approximately 40 to 45 days, and like most greens it should be grown without a check.

The soil should be worked to a fine tilth and should be enriched with well-decomposed animal manure or compost. Alternatively, a balanced fertiliser mixture, such as 15 parts of blood and bone, 5 parts of superphosphate, and 1 part of sulphate of potash (all by weight), can be worked into the top 6in. of soil at 8oz. to the square yard.

Seed should be sown thinly ½in. deep in drills 1ft. apart. Thinning may be done later, if the seedlings crowd each other unduly, and the thinnings may be cooked.

The round-seeded type of spinach is best for crops which are to mature in summer and autumn and may be sown successively up to the end of January.

New Zealand Spinach

New Zealand spinach is a half-hardy trailing annual with large, succulent leaves. It is not a true spinach, but is invaluable for use in hot, dry, sunny situations and is often preferred as a change from true spinach. Growth is rapid and the plant responds best to a light, fertile soil in a sunny position and adequate moisture. It is harvested by taking off about 3in. of the growing tips, which induces the development of new shoots, so that when established a plant has a multitude of tips for gathering.

As New Zealand spinach grows fairly large, plants should be given a spacing of at least 2ft. each way. Several seeds should be sown at each position 1 to 1½in. deep and all but one plant removed when seedlings have become established.

Salad Vegetables

Salad vegetables such as lettuce, spring onion, mustard, and cress should be sown successionally in small quantities, as they remain in the best condition for use only for a relatively short time. As quick growth is essential for quality, the soil should be rich in organic matter, moist, and cultivated to a fine, deep tilth.

In summer it is preferable to sow lettuce seed direct and to thin out seedlings rather than to transplant them. If lettuces are transplanted, the plants should be lifted with as much earth as possible attached to the roots and the bed should be watered before and after planting. The provision of some material to shade the lettuces will assist greatly in their establishment. Adequate watering is necessary during summer; it should be followed by applications of liquid manure and regular shallow hoeing.

Flushing of Ewes

By L. R. WALLACE, Senior Nutrition Officer, Department of Agriculture
Animal Research Station, Ruakura

THE idea that the level of nutrition is important in relation to the lambing percentage is by no means a new one. The Greek Aristotle, who died in 322 B.C., observed that sheep were more fertile when kept under good nutritive conditions. Scientists began to investigate the value of the flushing of ewes late in the last century. A number of scientific studies have been made since then, some in England, some in Russia, some in the U.S.A., and some in Australia. Oddly, the matter has been the subject of surprisingly little investigation in New Zealand, although if flushing really does increase the lambing percentage, it is obviously a practice which should interest almost all sheep farmers in the country.

DURING the 1949 and 1950 seasons, however, the practice of flushing ewes was under investigation at Ruakura and the main results of these experiments were given in a paper at the Ruakura Farmers' Conference week. This article is based on that paper.

Definition and Object of Flushing

Flushing is generally understood as putting ewes on to an improved diet shortly before and during the tupping period. Points usually emphasised are that the ewes should be in a rising condition at the time of service, but neither overfat nor severely undernourished at the time that flushing begins. The main object of flushing is to secure a higher lambing percentage.

What experimental work has been carried out suggests that the nature of the feedstuff used for flushing does not matter provided the ewes eat it readily and make good liveweight gains over the flushing period. Ewes have been successfully flushed on a variety of feeds—pasture, crops, and concentrates.

Ruakura has not conducted critical experiments in the flushing of rams before they are put out, but its aim is to do rams well for 3 or 4 weeks before putting them out, and results have been fairly good. Approximately 80 per cent. of the ewes get in lamb to their first mating heat.

If there is insufficient feed available to flush the whole flock, it would be preferable to flush the older ewes rather than 2-tooths. The former are inherently more fertile than 2-tooths and, it is thought, in consequence show a greater response to flushing. The low lambing percentage characteristic of 2-tooths is due partly to the relatively high percentage of animals which fail to lamb, partly to the relatively small proportion of twins obtained, and partly to a relatively high mortality rate among the lambs born. The most satisfactory way of increasing the lambing percentage of 2-tooth ewes would probably be through measures designed to reduce the number of ewes which fail to lamb and mortality among the lambs rather than by measures aimed at increasing the incidence of twinning. Although flushing might well lead to an increase in the twinning rate, the writer does not think it will reduce the percentage of dry ewes. The best way to attack the 2-tooth lambing-percentage problem would be by better rearing of hoggets.

Reproduction Process

If flushing does work, how does it work? Ewes, unlike cows, are seasonal breeders. They usually start coming into season in February, although many may not have their first heat before March. Unless a ewe is successfully tupped by a ram and becomes pregnant, she will normally continue to come on heat every 16 to 17 days until the end of the breeding season, which is about August. The length of heat period varies for different ewes, but the average is about 30 hours.

The lower diagram on the next page shows the reproductive organs of a female animal. Starting at the rear of the animal, where the reproductive tract opens to the outside, is a broad passage which leads forward and branches into the two horns of the womb or breeding bag, which contains the developing lamb or lambs during pregnancy. Each horn of the womb leads into fine tubes and each tube has at its end a small funnel, which surrounds the ovaries. Each ovary is about the size of a large raisin and these small bodies are of great importance, for it is in them that the ewe's eggs are produced.

During the breeding season there are usually a number of tiny blisters on the surfaces of the ovaries. Each blister is filled with fluid, besides which it contains a ripening egg. During the 3 or 4 days before a ewe comes on heat usually one blister (occasionally two or perhaps three) quickly grows bigger than the rest. Finally, after the ewe has come on heat one or more of the blisters, each containing a fully ripened egg, burst and the eggs pass into the funnel and on down the fine tube into the womb. If when travelling down the tube eggs are fertilised by sperms from a ram, each egg may easily develop into a lamb.

It is the number of eggs which are ripened and shed at the successful mating heat that determines the maximum number of lambs that the ewe can have.

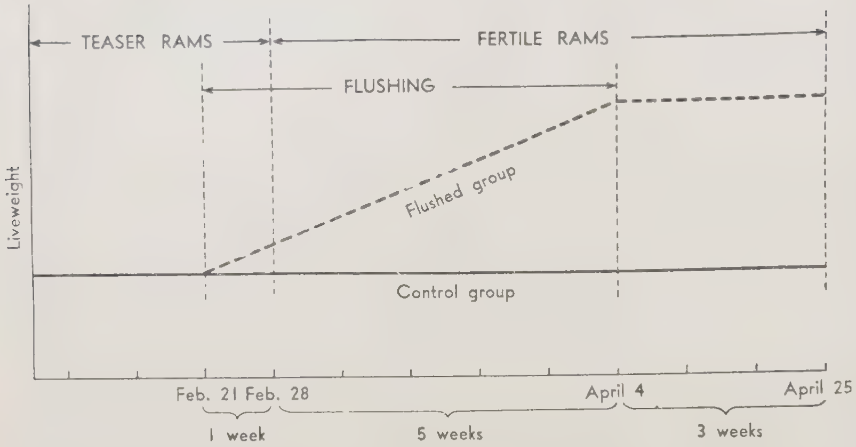


Diagram outlining main features of the flushing experiment.

If only one egg is shed, the ewe cannot have more than a single lamb; if two eggs are released, there is an excellent chance of twins being produced.

There is another important point. The ovaries are stimulated to ripen eggs by a chemical substance which is produced by the pituitary gland, a small pea-like body situated at the base of the brain. This chemical substance is liberated into the bloodstream and in this way reaches the ovaries. This is where flushing may be effective. The good level of feeding stimulates the pituitary gland to produce more than the ordinary amount of the chemical substance and the increased amount of the chemical substance causes the ovaries to ripen more than the usual number of eggs.

Ruakura Experiments

What has already been described is the basis of flushing. What follows deals with results in practice.

The general aim of the work done at Ruakura during the 1949 and 1950 seasons was to study the performance of two groups of ewes, one grazed on good pasture at tupping time, the other grazed in such a way as to maintain approximately constant weight over the tupping period.

In both years cast-for-age 5-year-old ewes off hill country were used. Those bought in 1949 comprised the complete annual draft of a farmer in the Waingaro district and were considered typical of the class of ewe being purchased by many fat-lamb raisers in the Waikato. Ewes for the 1950 season came from the Gisborne area and were typical of top-quality 5-year ewes available from that district. Both lots of ewes were in fairly thin but vigorous condition at the time they were purchased early in February.

In the diagram above an attempt is made to outline the main features of the experiment.

Each season after arrival at Ruakura the ewes were run together as a single flock under fairly hard grazing conditions till February 21, when they were split into two evenly matched groups. One group, which will be termed the flushed group, was thereafter for 6 weeks grazed upon the best pasture available—pasture which had been specially spelled for the purpose. For the same 6 weeks the second group, which will be called the control group, grazed on pasture which it was considered would permit neither gain nor loss of body weight. At the end of the period during which different feeding treatments were imposed the flushed and control groups were run together again under fairly hard grazing conditions.

Recording of Heat Periods

To record the date when each ewe came on heat raddled teaser rams were run with the ewes from soon after their arrival at Ruakura. The rams remained with the ewes until a week after the flushing treatment had been begun, but were then withdrawn and replaced by raddled fertile rams. The fertile rams were left with the ewes for 8 weeks in the first year and 10 in the second, and while they were out the two lots of rams were changed between the two groups regularly in case one lot of rams was better than the other. Both groups of ewes therefore had an equal chance of getting in lamb to the extent that this was affected by the rams.

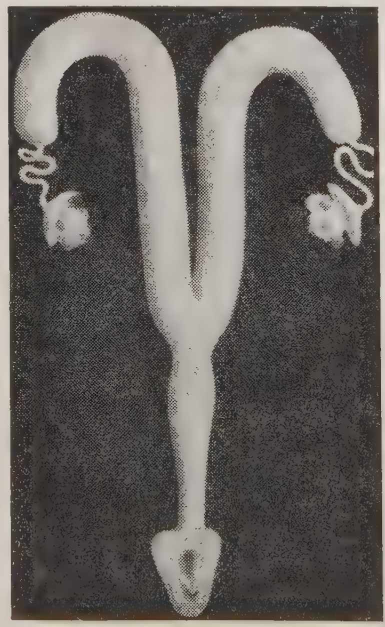


Diagram of reproductive organs of female animal.

The weight changes produced by the two different feeding treatments are given in Table 1, which shows the weight of each group on February 21, when flushing was begun, on April 4, 6 weeks later, when flushing was discontinued, and on April 25, a further 3 weeks later, when the rams were withdrawn.

TABLE 1—LIVEWEIGHT OF EWES

Date	Flushed lb.	Control lb.	Difference lb.
1949:			
Feb. 21 ..	117	116	1
April 4 ..	134	121	13
April 25 ..	126	114	12
1950:			
Feb. 21 ..	116	116	0
April 4 ..	131	122	9
April 25 ..	124	115	9

The control groups maintained, as was desired, reasonably constant weight over the experimental period, that is, during the 6 weeks from February 21 to April 4, although each year a slight increase occurred. The ewes of the flushed group made substantial weight gains. Both groups lost a little weight during the period of fairly hard grazing after flushing.

Some of the practical questions which the experiment was designed to answer were:—

1. Do ewes that are flushed come into season any earlier?
2. Does flushing affect the percentage of dry ewes?
3. Do flushed ewes that get in lamb produce more twins than those that have not been flushed?
4. Does flushing lead to a more concentrated or less concentrated lambing?
5. How long should ewes be flushed before the rams are put out?
6. How long should flushing be continued after the rams are put out?
7. Does flushing affect the death rate among lambs that do get born?
8. What condition should ewes be in when flushing is started?
9. What sort of result can be expected from a properly executed flushing programme?

The first question, whether the time of onset of first oestrus is influenced by the level of nutrition at tupping time, is of considerable practical importance. It is the writer's opinion that each year there are many farmers wanting early lambs who hopefully put out their rams earlier than the ewes are prepared to accept them.

Peak Heat Period

The results obtained in the experiments are illustrated graphically in the diagram on page 379. It shows, for the flushed and control flocks, how the total number of ewes to have been on heat built up as the season advanced. This build-up followed very much the same pattern each year. Early in the season odd ewes started taking the ram, but soon there came a period of 4 or 5 days when a very high proportion of the ewes came in season for the first time.

There is, however, one marked difference between the 2 years' results: The Gisborne ewes of 1950 came on heat about 10 days sooner on average than did the Waingaro ewes in 1949, but the reason is not known.

The results from flushing for the 2 years are quite consistent. Each season the flushed ewes in general came into season a little sooner than the control ewes, but from a practical point of view the difference is so small as to be of little or no importance. The only conclusion from the work at Ruakura is that flushing has virtually no effect in bringing ewes earlier to the ram.

Flushing of the ewes was begun only a short time before they would have taken the ram anyway. It is possible that had flushing been started very much earlier in the season, it might have produced some effect. There are reasons for thinking that this might be so, but there is no evidence to prove it.

Early Lambs or Concentrated Lambing

If early lambs are wanted, then rams must be put out early. It seems, too, that it may be necessary to pay some attention to the district or flock from which ewes are bought. If concentrated lambing is the objective, there is a greater chance of achieving it by putting rams out later than would be done to get early lambing. Difficulty would be experienced in getting both early and concentrated lambing, but the best compromise is to get rams out just before the first peak period of ewes coming in season. If that large number of ewes that come on heat in the course of a few days are missed, then it will be another 16 or 17 days before they will take the ram.

Whether flushing reduces the percentage of dry ewes has always been a controversial matter. The Ruakura experiments showed that in the first year the percentage of dry ewes was higher in the flushed group (10.7 per cent.) than in the control group (7.3 per cent.), but the reverse applied in the second season (3.2 per cent. in the flushed group and 4.5 per cent. in the control group). In the aggregate of both seasons there were more barren ewes in the flushed group than in the control group.

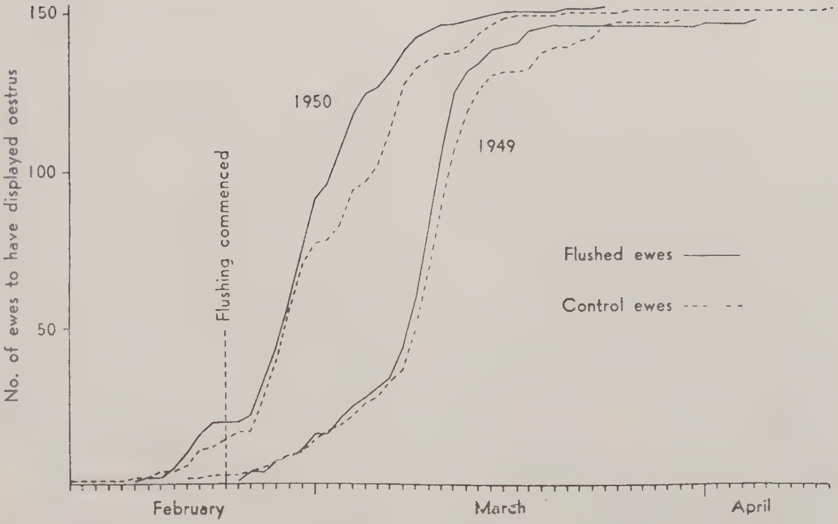
There is, however, more to the question than this. The readiness with which the flushed and unflushed ewes got in lamb must be considered. Table 2 shows for the two groups the percentage of ewes which held to their first service and that which held to the second.

TABLE 2

1949 season	Flushed Per cent.	Control Per cent.
Ewes which held to:		
First service ..	69	86
Second service ..	61	75
1950 season		
Ewes which held to:		
First service ..	80	95
Second service ..	66	71

Flushed Ewes More Difficult to Get in Lamb

In the 1949 season of the ewes which became pregnant 86 per cent. of those in the control group did so at their first heats after the introduction of the fertile rams, whereas for the flushed group the percentage was only 69. The same trend is apparent in 1950, with 95 per cent. of the control ewes and only 80 per cent. of the flushed ewes holding to their first mating heat.



Total of ewes which had shown at least one heat period during successive days of the breeding season.

Each season, of the ewes which failed to conceive outright there was a higher percentage in the control group which became pregnant at the second mating heat. One is forced to conclude, therefore, that flushing makes ewes more difficult to get in lamb. On average they return to the rams more frequently; as a result lambing is somewhat less concentrated and the mean date of lambing a little later, despite the fact that flushed ewes first accept the rams a little sooner than ewes not flushed.

These findings have an important bearing on the number of dry ewes, which will depend very much on how long rams are out. If the farmer decides to have rams out for a long period, it will not much matter if the flushed ewes are slow in conceiving; each will have repeated opportunities and most will finally get in lamb. It is probable that there will be no more dry ewes among flushed ewes than among unflushed; but the farmer who does not want any fairly late lambs and prefers a restricted breeding season may find that he will have an appreciably higher proportion of dry ewes among flushed ewes than among unflushed.

Table 3 shows the number of ewes which conceived during successive weeks of the tupping period.

TABLE 3

Week of tupping period	No. of ewes which conceived Flushed group	 Control group
1	77	88
2	98	137
3	44	29
4	23	15
5	12	7
6	9	7
7	11	2
8	6	1
9	1	0
Total	281	286
No. dry	21	18
Total	302	304

Table 3 emphasises that a considerably more concentrated lambing may be expected from ewes which have not been flushed and it illustrates what has been said already about dry ewes. Had the rams been taken out after 7 weeks, there would have been another 7 dry ewes in the flushed group, but only one more in the control group. If rams had been removed after 6 weeks, there would have been a further 11 dry ewes in the flushed group, but only another 2 in the control group. What these figures mean in terms of the percentage of dry ewes is shown in Table 4.

TABLE 4

Length of tupping period (weeks)	Percentage of dry ewes Flushed	 Control
9	6.9	5.9
8	7.2	5.9
7	9.2	6.2
6	12.8	6.9
5	15.8	9.2

Table 4 shows that if rams are withdrawn early, the risk of having dry ewes increases, particularly if the ewes have been flushed.

The number of offspring produced by the ewes that do lamb and how long before the introduction of the rams flushing should be commenced are both matters of practical importance. Table 5 shows the number in the flushed and control groups which were successfully tupped during each week of the tupping period and also the percentages of these that conceived twins.

TABLE 5—INCIDENCE OF TWINNING DURING SUCCESSIVE WEEKS

Week of tupping period	No. conceiving Flushed	 Control	Percentage with twins Flushed	 Control
1 ..	77	88	17	13
2 ..	98	137	25	16
3 ..	44	29	34	7
4 ..	23	15	44	7
5 ..	12	7	25	0
6 ..	9	7	56	0
7 ..	11	2	45	0
8 ..	6	1	0	0
9 ..	1	0	0	0
Total ..	281	286	27	13

Twinning Higher in Flushed Ewes

The twinning rate was consistently higher in the flushed group throughout the tupping period, but though a period of flushing as short as 1 week is sufficient to produce a slight increase in the percentage of twins, it is by no means long enough to effect the greatest possible increase. That the progressive rise in the percentage of twins up until the fourth week of the tupping period is due to flushing treatment is proved by the fact that there is no such increase in the twinning rate in the control group. Indeed, during both seasons, there was a much higher proportion of twins among the unflushed ewes which conceived during the first fortnight than among those which conceived later.

It must be concluded therefore that flushing does increase the percentage of twins and that for the best results ewes should be flushed for 3 to 4 weeks before they go to the ram.

How long should flushing be continued after the rams are put out? There is some indication that the beneficial effects of flushing may persist for about a fortnight after the flushing treatment is discontinued—there was a high percentage of twins in the flushed group during the 2 weeks after April 4, when both groups were running together under hard grazing conditions and losing body weight. Ruakura recommends that flushing be continued for 3 weeks after the rams are put out. If, as is thought, the flushing effect persists for a further fortnight after this, the recommended period for flushing provides 35 days when the ewes are in a highly fertile condition, which is sufficient time for most of them to come on heat twice.

Lamb Losses

Table 6 shows plainly that losses among lambs born as twins are higher, almost twice as high (14.3 per cent. as compared with 7.3 per cent.), as losses among lambs born singly. Therefore, if flushing is effective, more lambs and a higher proportion of lambs will be lost from flushed ewes than from unflushed ewes, because more lambs will be born and because there will be a higher proportion of twins.

It is most unlikely that the mortality rate in lambs born as twins could be reduced by providing the ewes with a better level of nutrition during the later stages of the tupping period and just after tupping. Indeed, the period mentioned is one during which ewes can be done fairly hard without ill effect. If ewes are grazed fairly hard during the later stages of the tupping period and just after tupping, feed grown during the autumn flush can be conserved and used later to prevent a feed shortage developing during the last month before lambing and to provide a good level of nutrition for the flock immediately after lambing.

TABLE 6—PERCENTAGE OF MORTALITY AMONG LAMBS

	Flushed ewes	Control ewes	Total
1949 season:			
Singles ..	6.5	6.5	6.5
Twins	16.7	7.1	14.2
1950 season:			
Singles ..	10.8	5.6	8.1
Twins	12.9	16.7	14.3
Both seasons:			
Singles ..	8.8	6.1	7.3
Twins	14.9	12.9	14.3

There are probably a number of factors causing higher mortality among lambs born as twins. Twins tend to be lighter at birth than singles, and if the level of nutrition is poor during late pregnancy, they may lack vitality at birth. The chances of mismothering are greater, particularly where one twin is weak and the other robust. Complaints such as sleepy sickness and bearing trouble are also usually confined to twin-bearing ewes. Any measure, such as drafting out, designed to give ewes with twins preferential treatment is to be recommended.

The differences shown in the summarised results (Table 7) between the final lambing percentage figures for the two flocks may be thought to be disappointingly small. Nevertheless they are large enough to be of considerable economic importance. The author believes they could have been much larger, for they were achieved by the adoption of what could be termed an unenlightened flushing programme. Many of the ewes had not been flushed long enough before they were allowed to take the ram.

What may be expected from an enlightened flushing programme such as that outlined below is shown in Table 8.

FLUSHING PROGRAMME

Flushing is commenced on February 7.

Rams are put out 3 weeks later (March 1).

Flushing is continued for another 3 weeks (until March 21).

From March 21 grazing is tightened up to provide early-spring feed.

TABLE 8

	Flushed	Unflushed
Ewes put to ram	100	100
No. which fail to lamb ..	6.9	5.9
No. which conceive before April 5	90.8	93.8
Per cent of these having twins	38.5	12.6
No. which conceive after April 5	2.3	0.3
Per cent of these having twins	0	0
Total No. of lambs born ..	128.1	105.9
Mortality percentage among singles	7.3	7.3
Mortality percentage among twins	14.3	14.3
Total deaths	14.1	9.4
Lambing percentage ..	114.0	96.5

TABLE 7—SUMMARISED RESULTS

	1949		1950	
	Flushed ewes	Control ewes	Flushed ewes	Control ewes
Ewes put to ram	150	150	154	154
Did not conceive (per cent.) ..	10.7	7.3	3.2	4.5
Lambs born per ewe lambing ..	1.30	1.11	1.24	1.14
Lamb mortality (per cent.) ..	11.1	6.6	11.6	8.4
*Lambing percentage	101	94	104	99

* Lambs alive at 28 days as per cent. of ewes put to ram.

World Census of Agriculture

Less Unimproved Occupied Land in New Zealand:

Numbers of Farm Implements

In the classification of the area of unimproved occupied land in the "Statistical Report on the Agricultural and Pastoral Production of New Zealand" the areas in tussock and other native grasses have formerly been shown each year as a combined total under the one heading. In the compilation of data for the 1950 World Census of Agriculture statistics of unimproved occupied land have been divided into two parts, which are shown in the "Monthly Abstract of Statistics" for May, 1951, as "Naturally established danthonia" and "Tussock".

The combined area in New Zealand in 1948-49 was given as about 13½ million acres and in 1949-50 as 12.9 million acres, of which just less than 1¼ million acres were in naturally established danthonia.

Statistics collected for the World Census of Agriculture in 1950 of the Dominion totals of farm implements and machines were published in the "Monthly Abstract of Statistics" for May, 1951, as follows:—

Threshing mills		347
Tin mills		277
Header harvesters		3,130
Chaff cutters		1,350
Reapers and binders		8,521
Hay sweeps		24,220
Hay rakes (including side delivery and dump rakes)		26,476
Hay stackers		11,719
Hay balers and presses		4,269
Mowers		39,603
Drills:	Combine	14,223
	Ridger	5,974
Ploughs:	Mouldboard	53,549
	Disc	8,716
	Mole drain	2,360
Harrows (number of sets):	Tine ..	46,246
	Disc ..	29,230
	Chain ..	30,528
Cultivators:	Inter-row	10,309
	Field	12,034
Manure sowers and spreaders ..		31,435
Rollers		16,737
Potato planters		827
Potato harvesters		1,067
Spraying machines (power driven)		1,676
Motor lorries and trucks		25,378
Motor cars		48,096
Farm carts and drays		41,715

New Home Vegetable Garden Bulletin

The importance of fresh vegetables in the diet is now widely recognised, but nutritionists also emphasise that rapid deterioration occurs in some vegetables if they are kept for a comparatively short time between harvesting and use. For that reason all families, wherever possible, should attempt to produce at least some of the vegetables they use.

The aim should be to have some vegetables available at all seasons, but to secure a succession is often the most difficult problem for gardeners. Advice on this and other aspects of the growing of vegetables is contained in a most comprehensive bulletin just published by the Department of Agriculture, "The Home Vegetable Garden". Copies are available at 2s. 6d. each, post free, from main offices of the Department or from Whitcombe and Tombs Ltd.

HEADING PHOTOGRAPH: A contoured hillside in Marlborough.

Horticultural Crops in the Marlborough Sounds District

By S. FREW, Orchard Instructor, Department of Agriculture, Motueka

QUEEN CHARLOTTE SOUND, with its bush-clad mountains and sheltered bays providing excellent bathing and fishing, is renowned as a holiday resort, but seldom has serious thought been given to horticultural development of the area. Apart from isolated sheep farms in some of the cleared and flatter areas, the land has been left in its natural state with only the unfortunate ravages of fire to spoil the beauty of the native bush in some parts. Recently, however, the possibility of utilising some of the land for horticultural crops has been considered by a few venturesome settlers and the progress to date indicates at least the promise of success, despite the many obstacles which had to be overcome.

THE large influx of visitors to the Sounds during summer and autumn has been responsible for the birth of the idea of growing horticultural crops there. The clamant demand from these visitors for fresh vegetables and fruits has disclosed the serious local shortage and the difficulty of providing delivery from distant growing areas at economic prices. Though many have considered the idea of a locally provided supply, it was a Wellington business man, Mr. J. E. Vogel, who owned a property in the Sounds, who made the first real move toward undertaking the establishment of a fruit and vegetable farm there.

Economic Possibilities

In weighing up the pros and cons of such a venture it seemed that at best it was very doubtful whether it could ever be a success, although there were some favourable features in the proposition. In addition to a ready-made market for the produce the locality was known to be reasonably frost free and in favoured pockets the climate even approached subtropical. The area's isolation from other horticultural areas was also perhaps of some benefit, as many of the common plant diseases were unknown in the area. Again, the land is cheap, even taking into consideration that a large area has to be purchased to obtain a few acres of suitable ground. Lastly, no labour difficulty was expected, as it was thought that many people, especially youths, would be only too willing to combine a holiday in the Sounds with the promise of part-time work.

General Unsuitable Conditions

The Sounds district, as a whole, however, is not suitable for horticultural development. Topographical features alone are a definite obstacle. Most of the country is steep and broken, with peaks and ridges rising in a number of places to between 3000 and 4000ft. The majority of these slopes are far too steep for cultivation and the soil generally is shallow, although built up with decayed vegetation to a satisfactory humus content. A heavy rainfall, nearly 70in. annually, falls mostly during winter and spring; the summers are sometimes very dry. Naturally, in winter the flats remain waterlogged, and immediately the land on the slopes is cleared, the winter rains cause serious erosion, the limited topsoil rapidly becomes lost, and the land is soon made barren and useless. Even when precautions are taken to prevent erosion drought conditions in summer are a serious disadvantage which must be overcome.

The peculiar topography of the Sounds also makes shelter from winds a problem. The very high winds which occur at times are gusty and swirl down over the ridges into the valleys and gullies and seem to come from every direction. Again, the steep nature of the hills means that the hours of sunshine are reduced, many otherwise suitable pockets either receiving the sun too late or losing it too early.

A further hindrance to economic production is the isolation of the Sounds. No roads exist, and all transport is by launch or barge, the port of Picton being the sole link with the outside world. All seeds, fertilisers, equipment, and stores have to be brought in by sea, and all produce delivered likewise, either to the port of Picton, or to the numerous guest houses and private holiday residences in the many bays and inlets bordering the coast. Compared with road and rail services, launch transport is costly, slow, and far more dependent on the weather. Queen Charlotte Sound is an inland sea which at times can become comparatively rough for small boats.

With these not inconsiderable obstacles a project to develop horticultural crops required substantial resources, great initiative, a sound local knowledge, and a great deal of hard work, especially in the preparatory stages.

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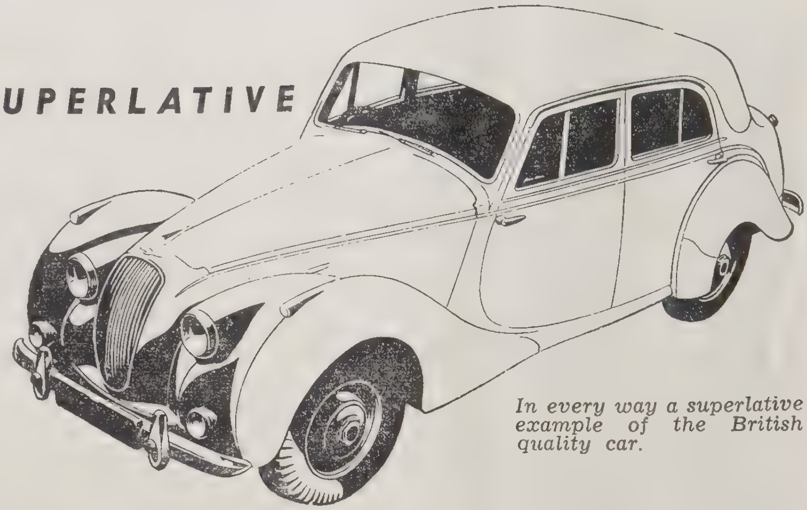

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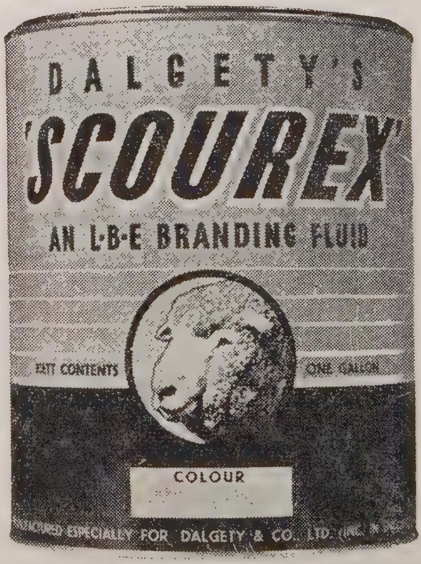

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Left—Strawberry area under wire netting. Right—Boysenberries are grown on wire on the lower terraces.

Initial Work

Mr. Vogel decided to go ahead with the scheme. Having purchased a 300-acre abandoned sheep farm in Onahau Bay, he became determined to develop it on new lines, embracing the growing of a diversity of horticultural crops. His property lay at the head of the bay, which was a short inlet extending from the Grove arm of Queen Charlotte Sound. Situated at the not uneconomic distance of 6 miles from Picton (¾-hour launch trip) his land nevertheless was typical Sounds country. A small patch (2 acres) of flat low-lying land near the water's edge extended for a short distance as a gradual slope, then ran steeply on all sides until a sloping plateau was reached at a height of some 300ft. There some pockets with a northerly aspect, lying well to the sun, contained soil of fair depth. Above this the land rose steeply up to a high ridge.

It was decided to concentrate upon the most suitable areas, a total of about 6 acres. A tremendous amount of preparatory work had to be done. A jetty had to be built, fortunately only a small one, as the head of the bay provided not only a safe anchorage for launches but the water was deep right to the shore. A roadway had to be formed from the jetty to the old homestead on the flat land and a further road carved out of the hillside up to the plateau. The scrub and bush was then cleared from these blocks. Drains had to be dug in the flat land to make it at all arable and diversion ditches made along the plateau to cope with the heavy run-off from the ridge.

Gradual Development

A production programme was then prepared. It was decided to try vegetable crops on the richer, flat land, berry fruits on the adjacent slopes, and tree fruits on the plateau. The first season was devoted to concentrating on the flat land, which was deep ploughed and heavily limed, tests having shown that all the area had a serious lime deficiency. Heavy dressings of superphosphate were also applied, as the phosphate content of the soil was also found to be dangerously low, while nitrogen was provided in the form of sulphate of ammonia and blood and bone dressings.

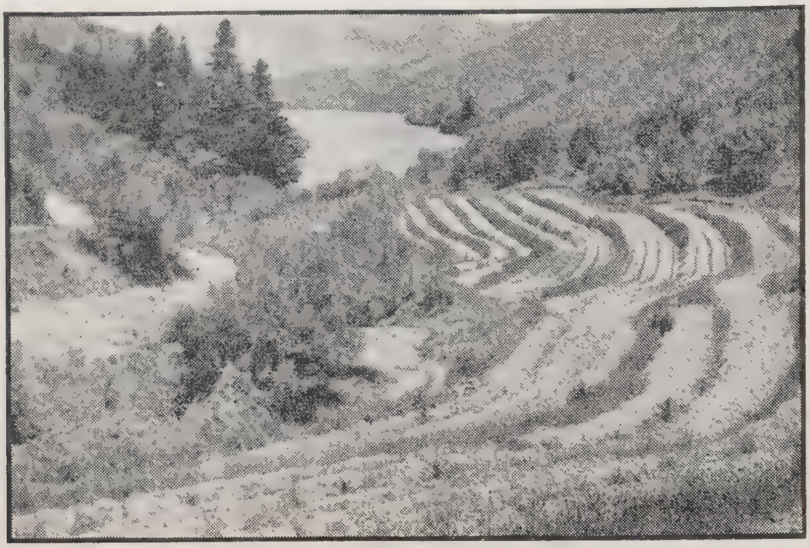
Some fairly satisfactory crops were raised in this first year during the summer, the moist condition of this low-lying land proving very suitable for summer vegetation. Lettuces, tomatoes, peas, beans, cabbages, and sweet corn all proved to be good crops, while partial success was obtained with root crops such as beet, carrots, and parsnips. As had been expected, disposal of this production was easy once the transport difficulty was overcome. A 39ft. launch with an extra-large cockpit proved very suitable, as large loads of produce could be moved in one shipment. In a limited way the small beginning had shown the possibilities of future success for the scheme and provided the opportunity for trying out the system of sale and distribution.

Expansion of Development, Contouring of Hillsides

Encouraged by initial promise of success, Mr. Vogel decided to carry out the balance of his programme the next year. This was a more ambitious undertaking, as once land away from the flats was to be cultivated, the threat of soil erosion during winter and the danger of summer drought conditions had to be countered. It was decided that planting was likely to be successful only by introducing the contour system. Contours could be made to serve two purposes: Not only were they the only practical answer to soil erosion, but local experiments indicated that greater retention of moisture during drought periods had been achieved on contoured areas.

With the assistance of the local soil conservation officer and a surveyor contour lines were marked out on the slopes proposed to be developed. On the plateau slopes, which it was planned to plant in stone fruit trees, the lines were marked out averaging 18ft. apart, while on the lower slopes, required for berry fruits and tomatoes,

Bush typical of that which was on the land before it was cleared.



Contoured terraces prepared for tomatoes. In the background is the head of Onahau Bay.

the lines were marked at approximately 6ft. intervals. Planting was then carried out on these lines, the fruit trees being spaced at an average of 10ft. intervals in the rows. Where the contours contracted and became relatively close the space between the trees was correspondingly lengthened, and where the contours were comparatively wide the trees were planted a little closer in the row; the overall effect was to give each tree approximately the same area for root development.

The same principle was followed with the planting of the berry fruits on the lower slopes, but in this instance rows were an average of 6ft. apart, as is customary with these fruits.

A ribbon of clover seed was then sown along the tree lines to help to contain the soil on these strips. The land between the rows was then ploughed and cultivated in the normal manner, the object being ultimately to transform the hillside into a series of terraces, the clover strips becoming the terrace banks.

Water for Irrigation and Spraying

As it was considered that even the contouring of the hillside might be insufficient to cope with the heavy downpours sometimes experienced, a water channel was dug above the cultivated area, the water being directed into a well on the edge of the orchard block, the overflow from this running into the gully below. The well primarily will supply the water for spraying the fruit trees and also will be the nucleus of an irrigation supply.

To facilitate gravity irrigation a departure from the usual method of contouring was made. Instead of contours being formed perfectly level, a zig-zag grade of 1 in 200 was allowed. That is, the top line had a very gradual slope downhill in one direction, the second line a similar slope in the reverse direction, and so on. Thus it was hoped the water would flow slowly down the hill in a zig-zag fashion.

Shelter

It was found that the bordering bush effectively sheltered the flat land from all serious winds, but a strange and eminently satisfactory phenomenon occurs on the hillside. The prevailing wind does not blow directly on to the hillside, but strikes the top of the ridge, and then swirls down the slope. A shelter belt was therefore planted above the orchard, and as the slope has a northerly aspect, wind protection should be achieved without loss of any sunshine.

Present Position

The third season (1950) was devoted to gradual improvement of the whole area under development and it is now possible to see some results. These are encouraging, although there is still room for great improvement. Recent soil tests have still shown a serious lime and phosphate shortage and further applications of lime and fertiliser will have to be made before really good vegetable crops are grown. The stone fruit trees and strawberry and boysenberry areas are thriving, however, and the property generally is beginning to assume an orderly appearance.

As expected, the contoured areas have rapidly formed terraces, as will be seen by the accompanying photographs. With cultivation the land has become remarkably friable and the terraces are now level and easily worked. Intensive manuring is being done systematically, and again advantage has been taken of the farm's geographical position. In the same Sound as the property is the principal New Zealand whaling station and it has proved economic to collect whale meat refuse by barge. This has been applied in abundant dressings and the results have been outstanding. Vigorous growth has occurred wherever the refuse has been applied, and it is intended eventually to cover the whole area with the material as supplies become available.

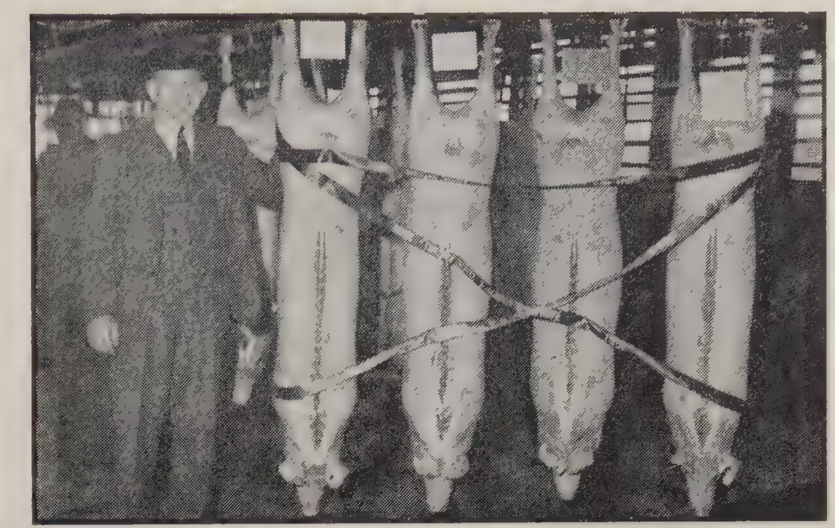
Success so Far

This unusual experiment in horticulture can be said to have been a success so far. To date all difficulties met have been overcome, although this has been possible only by hard work and the expenditure of a large amount of capital upon equipment and materials. A calf-dozer for road construction, a converted Bren gun carrier for transport in the initial stages, a rotary hoe, tractor, and cultivating equipment, spraying equipment, a launch, and large quantities of fertiliser have all been necessary to ensure success. Even so it will be a few years before the property will be in full production. The whole venture will be an outstanding example of what can be done to bring even apparently most unsuitable country into intensive production.

Clover established on contour bank. Note the depth of the terrace and the level cultivated areas.

Porker and Baconer Competitions in 1951

DURING the 1950-51 production season interest has been well maintained in the competitions organised throughout New Zealand for porker or baconer carcasses and for cured bacon. In this article competitions are reviewed by A. Longwill, Superintendent of the Pig Industry, Department of Agriculture, Wellington.



[*Sparrow Industrial Pictures Ltd. photo.*

Mr. C. Schwass, Gisborne, with the entry with which he won the baconer championship in the competition conducted by W. and R. Fletcher (N.Z.) Ltd.

OF the competitions based on judging as carcasses the one which has created the greatest interest is that conducted by W. and R. Fletcher (N.Z.) Ltd. Entries were received from all parts of the North Island and for the third time in succession the best team of baconers came from the Gisborne district. Mr. C. Schwass, a sharemilker on Pakowhai Station, Gisborne, was the successful competitor and also took the prize for the highest aggregate points for baconers and porkers. The champion porker team was entered by Mr. V. S. Cope, of Whitford, who has previously been prominent in the baconer section of the competition.

In the competition each entry consists of a team of 4 pigs. Each carcass is allotted points on the points system approved as the national standards for carcass judging. Maximum points per pig are allocated as shown in Table 1.

TABLE 1—ALLOCATION OF POINTS FOR CARCASSES

	Baconers	Porkers
By measurement:		
Body length	20	20
Backfat { loin	20	15
Backfat { shoulder ..	10	10
Balance of side ..	5	5
Eye appraisal:		
Hams	15	15
Shoulders (fore end) ..	10	10
Development of loin ..	10	10
Marketing points ..	5	10
Belly thickness	5	5
	100	100

Deductions up to 10 points per carcass are made where the carcass weight does not fall within the desirable weight range. Until the past season this range has been 136-160lb. for baconers and 70-90lb. for porkers, but it is likely, in view of the premium on light porkers exported, that the weight standards for porkers will be adjusted to a slightly lighter range for future competitions.

Where teams of pigs are judged, as in the W. and R. Fletcher (N.Z.) Ltd. competition, points are awarded for evenness of weight (10) and for conformation (10) and the maximum score for a team of 4 pigs is 420. For the past 2 years there has been a section in the competition in which pigs whose birth dates are recorded and certified by district pig council supervisors compete for special prizes awarded on the basis of combined total points for carcass quality and growth rate (420 possible for carcass quality, 100 for growth rate). In this section a team must have high carcass points to win, but teams which have gained carcass points at the expense of growth rate are adequately penalised. This provides a much more satisfactory basis on which to assess the worth of each team than is possible where information on growth rate is lacking.

District Winners Compared

The performance of teams from the Tairawhiti (Gisborne and east coast) district was most commendable, especially in view of the relatively small number of entries from the district. The 3 top baconer teams in that district averaged 343 points, or 10 points better than a similar average for any other district. Similarly the 3 top porker teams from Tairawhiti averaged 334 points, which was 3 points better than the average for the Auckland district, which produced the champion porker team.

TABLE 2—POINTS SECURED BY PRIZEWINNING TEAMS: DISTRICT AGGREGATES AND AVERAGES

District		Individual team points			Total	Average
Tairawhiti	Baconers	347	345	336	1,028	343
	Porkers	335	334	333	1,002	334
Taranaki	Baconers	338	334	326	998	333
	Porkers	340	332	315	987	329
Auckland	Baconers	331	330	332	993	331
	Porkers	342	328	324	994	331
Northland	Baconers	340	326	322	988	329
	Porkers	332	330	326	988	329
Wellington	Baconers	326	325	319	970	323
	Porkers	325	323	318	966	322
Waikato	Baconers	316	314	308	938	313
	Porkers	331	330	329	990	330
Bay of Plenty	Baconers	311	301	299	911	304
	Porkers	321	318	315	954	318
Y.F.C. section	Baconers	338	310	304	952	317
	Porkers	340	318	316	974	325

The points scored by the 3 winning teams in each section are averaged in Table 2. District sections are arranged in order of the aggregate carcass score for both porkers and baconers of their three top teams. The Young Farmers' Clubs section, though entered in a separate competition, has been included for comparison.

A comparison of points scored by this year's prizewinners with those of previous years shows that from 1946, the year when the present system of awarding points was adopted, there has been a tendency for winning teams to gain fewer points. In an analysis of all points awarded in last year's competition (published in the November, 1950, issue of "The New Zealand Journal of Agriculture") it was concluded that the over-all quality of the entries was declining.

The conclusions serve to re-emphasise two basic needs of the industry if quality improvement is to be achieved:—

1. Application of a system of carcass grading which provides adequate financial encouragement for producing the quality required and under which farmers receive information on faults in their pigs, which they should aim to correct.
2. The establishment of a testing system for purebred stock which will provide breeders with a more accurate measure of performance than they are able to obtain today to assist them in selecting breeding stock.

The former would give an impetus to the elimination of the undesirable pigs, which have to be graded down: and the latter would supply the tool which breeders need to ensure steady

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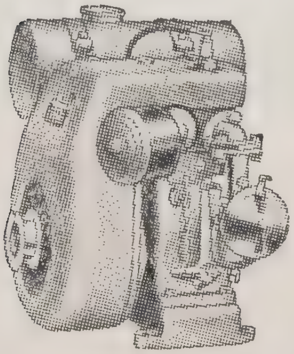

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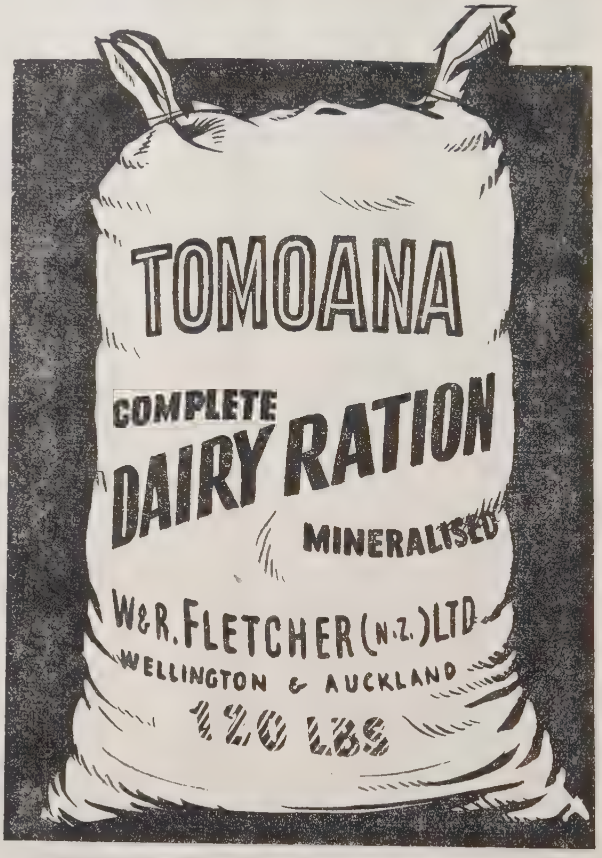

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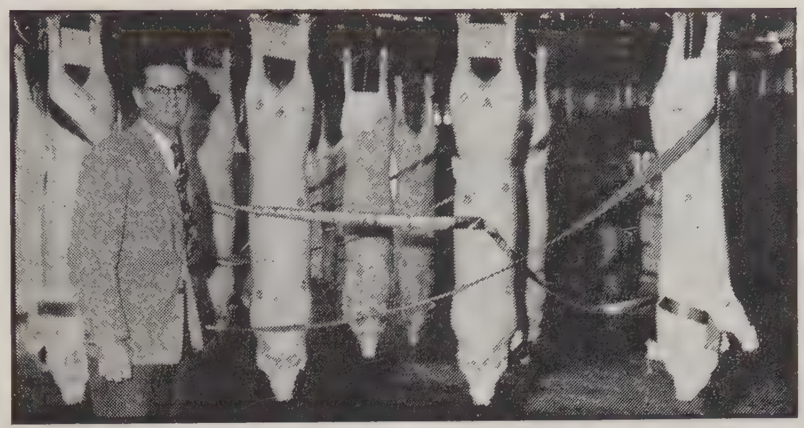
progress in the improvement of the commercial characters of their breeding stock, which is the source from which over-all improvement in the general level of quality and performance must spring.



[*Sparrow Industrial Pictures Ltd. photo.*

Mr. W. S. Cope, Whitford, with the entry with which he won the porker championship in the competition conducted by W. and R. Fletcher (N.Z.) Ltd.

Efficient Performance on Farm

As has already been mentioned in reviewing competitions in recent years, steps in the right direction have been taken by the introduction of special sections into certain competitions for pigs whose growth rate is known and, in some cases, whose history includes full litter-recording data.

This type of competition provides a much more satisfactory basis for the assessment of the merit of any carcass than where carcass quality is the sole criterion. In the latter type of competition the winning pig may have been 9 months or even 1 year old and produced at a loss. Obviously this would be a very unsound basis on which to try to make any assessment of the worth of the strain concerned.

Canterbury Competition

The recorded section of the Canterbury District Pig Council's Bacon Competition goes as far as it is possible to do, short of testing-station work and the cutting of the bacon side for complete appraisal of proportion of cuts, lean meat, and streak. The standards used in judging the bacon sides are those adopted for carcass judging and points are allocated as is indicated in Table 1. The farm points allotted and awarded to the 3 prizewinning entries in the 1951 competition are shown in Table 3.

A carcass score of 70 points or more is regarded as satisfactory and certificates of merit are issued for all sides in the competition which reach this standard. When, as in the case of these entries, standards of performance on the farm are up to the standard set it can be said safely that the type of stock being used and the management are highly commendable. Messrs. V. H. Moore (first prize) and F. D. Higgins (second and third), both of Wakefield, Nelson, are to be congratulated on the all-round merit of their performance.

Differences in Efficiency

The importance of efficient performance on the farm in relation to the profits obtained from pigs cannot be too strongly stressed. Though reasonable prolificacy is safeguarded almost automatically by the producer culling any sows which fail to rear an average-size litter, selection on observation alone is not nearly so effective in estimating sows' milk production, which can be measured by total litter weight at 3 weeks, or efficiency of food conversion from weaning to slaughter.

TABLE 3—POINTS AWARDED TO THREE PLACE WINNERS IN RECORDED SECTION, CANTERBURY BACON COMPETITION, 1951

	Maximum points	1st prize L.W. x B.	2nd prize L.W.	3rd prize L.W.
Farm points:				
Litter performance:				
(a) Pigs weaned (1 point per piglet)	10	10	10	10
(b) Litter weight at 8 weeks (400lb. maximum; minus 1 point for each 10lb. under 400lb. to 300lb., then 2 points for each 10lb.)	20	20	20	20
Growth rate (daily gain from birth to slaughter of 0.75lb. dressed weight per day or better)	20	20	20	20
Carcass-quality points	100	77	75	74
Total points	150	127	125	124

TABLE 4—TEAMS GAINING MOST POINTS IN GROWTH-RATE SECTION

Entrant	Breeding	Date of birth	Age at slaughter days	Average dead-weight (lb.)	Standard age for weight days	Points Growth	Points Carcass	Total
Baconers:								
B. D. J. Wright, Pukekohe East	L.W. x B.	29/ 8 /50	192	143½	185	88	317	405
H. and N. Myers, Mauriceville	L.W.	17/ 9 /50	214	146½	188	59	325	384
J. G. Fowell, Whitford ..	L.W.	24/11/50	208	134	175	51	331	382
W. Luxton, Whakatane ..	L.W. x B.	2/ 8 /50	182	147	188	100	273	373
Porkers:								
D. C. and A. R. Brown, Ardmore	L.W. x (T. x B.)	22/12/50	97	70	111	100	309	409
E. M. Dyer, Onewhero ..	L.W. x B.	15/ 1 /51	123	81	122	96	310	406
J. M. Rendall, Waipipi ..	L.W. x B.	18/12/50	116	69	110	86	318	404
J. F. Bremner, Ballance	L.W.	2/12/50	135	86	127	84	318	402
H. L. Linton, Matakana	L.W.	29/ 9 /50	132	76½	118	69	332	401
W. H. Baker, Koromatua	L.W. x B.	16/12/50	144	87	128	69	329	398
C. Darby, Bombay ..	B. x D.J.	20/11/50	130	89	130	99	287	386
G. Bennett, Inglewood ..	L.W. x B.	18/ 1 /51	131	77½	119	74	309	383
J. W. Wilson, Norsewood	L.W.	26/ 9 /50	112	78	119	100	280	380
Shaw Bros., Whakatane	L.W.	17/ 2 /51	116	70	111	89	289	378
Ashleigh Stud, Wanganui	L.W. x B.	7/12/50	145	84	125	63	313	376

Some written record is necessary as a basis from which to start any real selection for milk-production and food-conversion ability. Litter recording (recording the weights of litters at 3 weeks and 8 weeks of age) is the accepted means of checking sows' productive efficiency. Though the heavy weaner usually has an advantage in growth rate right through to slaughter over pigs weaned at lighter weights, this does not mean that it is automatically the most profitable pig.

Profitability depends not on rapid growth alone, but also on high efficiency of conversion of food into meat and a carcass of high quality. Experiments at the Department of Agriculture Animal Research Station, Ruakura, have shown that though the most efficient strains are able to put on 1lb. liveweight in the weaner-baconer period for less than 3lb. of food (3 food units), wild-type pigs required 6lb. of food to make the same gain. If food is costed at 2½d. per 1lb. (or per food unit), the 480lb. difference in food consumption between efficient and inefficient pigs represents a difference in profit of £5 per pig. This is not the whole story, however, as the extra labour entailed and the longer use of accommodation required to fatten inefficient feed converters makes them even less profitable.

North Island Competition

In the entries for the growth-rate section of the 1951 North Island competition it was possible to demonstrate that growth rate had a very considerable influence on the profits obtained, amounting to more than £2 per pig as between the best and the worst baconer teams, but this was not the sole criterion of profit. Carcass quality was important, too, and the winning teams in this section were those which scored most points when the points awarded on both these aspects were combined. Allocation of points was as follows:—

	Team of 4 pigs
Carcass points	400
Evenness of weight ..	10
Evenness of conformation	10
Growth rate	100
	520

Table 4, on the previous page, shows the teams which gained 365 points (70 per cent. of the possible) or more.

Maximum profit depends on both growth rate and carcass quality, and selection of breeding stock for carcass quality can be made accurately only when pigs are grown under similar conditions of housing, feeding, and general management. This is the basis of the litter-testing stations operating in a number of countries.

If commercial producers request information on performance when purchasing their breeding stock from pedigree breeders and are prepared to pay a premium for the proven stock, breeders in New Zealand will be encouraged to adopt a testing scheme. New Zealand lags behind other countries in not having such a scheme and producers should not be content to do that.

Feeding Also Important

The breeding of the right strain of pig is only the foundation; intelligent feeding and management must follow if best results are to be obtained from good breeding. Because in New Zealand it is necessary to produce baconers and porkers from the same breeding stock, it is not practicable to concentrate on specialised porker or baconer types. The aim must be a dual-purpose type which, with proper management, will produce either a 70-80lb. porker carcass or a good, medium baconer.

In either case a good start is required to build up lean meat. As there is a tendency for lean meat to develop early, it is considered virtually impossible, with all but the old-fashioned short, fat type of porker, to overfatten the under-80lb. carcass. Up to this stage it is profitable to feed meals, particularly in the creep and for a few weeks after weaning. After the porker stage the feeding of meals is unprofitable. This emphasises the importance of a good start.

After the porker stage some restriction of feeding is necessary if a high-quality baconer is to be produced from the type of pig generally kept in New Zealand. Experiments in the past have shown that this restriction can be made without increasing the total amount of feed required to produce a carcass of a given weight.

The Need to Look Ahead

The points brought out by the competitions and the demonstrations given at competition field days are most valuable and should be given close attention. Larger entries in recorded or growth-rate sections would encourage interest in the proper evaluation of performance in pigs. Finally, however, it will be necessary to establish stations for accurate testing of the performance of pedigree pigs of all breeds. Breeders and others concerned with the progress of the pig industry should be making preliminary plans so that further steps in a well-planned development of the industry can be taken at the appropriate time.

Record Carcass Score

Among the notable performances in the competitions was the scoring of 90 points out of the possible 100 by a 136lb. baconer carcass from a purebred Large White bred by Mr. I. B. Julian, of Kakaramea, south Taranaki. The pig competed in the baconer class at the Marton agricultural and pastoral show. The carcass when judged on the hooks proved to be the highest-scoring pig to date under the national judging standards. The details of points gained by the carcass were:—

	Possible	Points gained
Body length	20	17
Balance of side	5	5
Backfat loin	20	20
Backfat shoulder	10	10
Belly thickness	5	5
Hams	15	13
Shoulders	10	9
Development of loin	10	8
Marketing points	5	3
	100	90

In a further year of useful competition work some progress has been made, particularly in the increased interest in recording the farm performance of pigs entered in carcass competitions. However, it would appear that re-introduction of more selective commercial grading, with a premium for the better-than-average carcass, and the adoption of more accurate measures of performance of purebred strains are essential if steady improvement is to be made.

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METEOROLOGICAL RECORDS FOR SEPTEMBER

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit): Approx. mean	Air temperatures: Difference from normal	Absolute maximum and minimum: Maximum	Absolute maximum and minimum: Minimum	Rainfall in inches: Total fall	Rainfall: No. of days of rain	Rainfall: Difference from normal	Maximum fall: Amount	Maximum fall: Date	Bright sunshine hours
Kerikeri	201	53.6	— 0.2	71.0	32.0	3.21	9		1.45	28	133.6
Auckland	160	55.4	+ 0.9	66.6	39.4	0.74	10	— 3.24	0.24	20	114.8
Tauranga	10	52.7	+ 0.2	69.0	32.4	2.28	11	— 1.91	0.82	23	162.7
Ruakura	131	50.1	— 0.8	67.7	27.3	1.22	9	— 2.60	0.55	23	128.2
Rotorua	969	50.6	+ 1.9	67.0	28.2	0.91	7	— 3.98	0.23	4	151.8
Gisborne	12	52.2	— 0.4	73.9	34.0	0.31	5	— 2.27	0.20	2	179.5
New Plymouth	160	52.0	+ 0.3	66.2	33.9	2.06	15	— 2.92	0.53	4	145.1
Napier	5	52.6	+ 0.6	74.9	32.4	0.03	2	— 1.98	0.02	5	189.2
Karioi	2125	45.4	+ 0.4	67.0	24.0	1.43	9	— 2.91	0.35	20	
Wanganui	72	52.3	+ 0.2	68.9	33.8	0.47	8	— 2.40	0.18	24	141.4
Palmerston North	110	51.0	+ 0.5	71.1	29.8	0.71	9	— 2.37	0.20	4	120.1
Waingawa	350	49.8	+ 0.5	75.0	27.0	0.52	10	— 2.96	0.21	1	181.8
Wellington	415	51.2	+ 1.3	66.7	36.0	0.62	7	— 3.03	0.21	4	180.5
Nelson	24	51.1	+ 0.7	68.1	33.2	1.01	5	— 2.47	0.42	29	222.9
Blenheim	12	51.6	+ 0.9	71.6	31.6	0.12	4	— 2.20	0.07	20	222.2
Hokitika	12	48.5	+ 1.1	61.4	30.8	8.62	17	— 0.40	1.54	27	131.9
Hanmer Springs	1225	47.6	+ 1.5	75.0	22.2	1.25	8	— 3.34	0.75	20	167.5
Christchurch	22	49.8	+ 1.1	74.7	27.2	0.33	7	— 1.68	0.11	16	179.3
Timaru	56	48.9	+ 1.0	70.9	28.5	0.27	7	— 1.64	0.07	28	116.4
Alexandra	520	47.9	+ 0.8	69.4	27.0	0.97	8	+ 0.16	0.33	28	146.5
Taieri	80	46.8	— 0.9	69.8	25.8	1.37	14	— 0.70	0.43	16	130.0
Invercargill	32	46.8	— 0.6	68.0	28.0	3.49	21	+ 0.06	0.53	18	137.6

Vaccination against Contagious Abortion

APPLICATIONS by farmers for vaccination of their calves against contagious abortion in 1952 are now due. The charge is 2s. per calf for the first 14 calves in any herd and 1s. 6d. per calf thereafter. The closing date for applications is January 13 and a late fee of 10s. is payable on all applications received after this date.

As in previous years members of veterinary clubs should apply to the secretary of their club, and other farmers should apply to their nearest Inspector of Stock, from whom they can obtain the necessary application forms. Applications to Inspectors of Stock must be accompanied by a cash payment calculated on the basis of the charges mentioned above.

It is desirable that applications be sent in as early as possible so that vaccinating officers can arrange the work efficiently. Farmers are therefore requested to forward their applications by January 3.

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Subscription Rates to the "Journal"

The subscription rate to "The New Zealand Journal of Agriculture" within New Zealand is now 10s. a year and the overseas subscription rate is 13s. (sterling) a year. New Zealand school subscriptions are 5s. a year and the subscription rate for New Zealand forces serving overseas is 10s. (sterling) a year. All subscriptions include free postage. Subscriptions in force before August 1, 1951, are not affected by the increased rate.

Single copies of the "Journal" can be bought from the Department of Agriculture or from booksellers and newsagents for 1s. each.

Subscriptions for members of Young Farmers' Clubs and Country Girls' Clubs will be increased to 5s. a year in 1952, those for school clubs from the January issue and those for other clubs from the April issue.

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Injury to Grapes from Hormone Weedkiller

By J. D. ATKINSON, Fruit Research Station,
Department of Scientific and Industrial Research, Auckland

WITHIN 2 years of the release of 2, 4-dichlorophenoxyacetic acid (2, 4-D) as a weedkiller reports of injury to grapes began to appear in various journals, and damage to this crop has now been recorded from Australia, France, Hawaii, Italy, New Zealand, North America, and Switzerland. A number of research workers have shown that grapes are liable to suffer damage from trace amounts of this material in the form of spray drift. Although Atkinson (1947) and Helson (1950) have both published warnings in New Zealand of the dangers attending the use of 2, 4-D near various crops, grapes may be damaged by such small amounts that a special warning is necessary.

INVESTIGATIONS have shown that 2, 4-D vapour may cause damage to plants at considerable distances from the point of release. Thus Staten (1946) demonstrated that 2, 4-D vapour would injure cotton plants 30ft. from a dish containing a volatile solution. Mullison (1949) showed that vapour from volatile esters of 2, 4-D damaged tomato, bean, and cotton plants. Atkinson (1947) found that vigorously growing tomatoes were so sensitive to injury from vapour that when plants treated with trace amounts of 2, 4-D were placed in a glasshouse with untreated plants the untreated plants developed typical damage. Johnson (1947) reported injury to grape leaves 50ft. from an area treated with an emulsion of 2, 4-D, and he considered that damage was probably caused by vapour rather than drift.

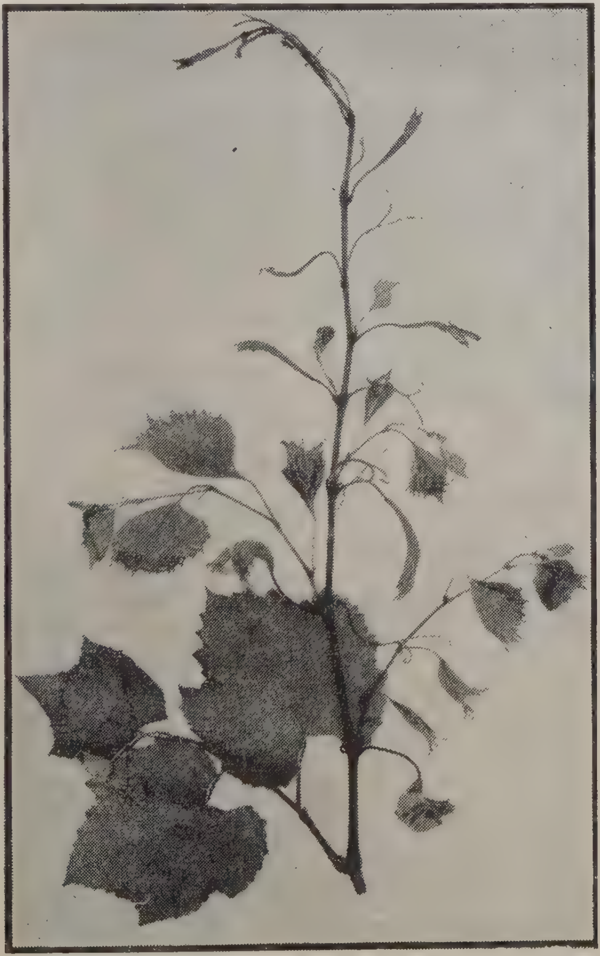

Fig. 1—Shoot from Albany Surprise vine treated experimentally with 2, 4-D vapour, showing severe distortion at tip of lateral and unaffected leaves at base.

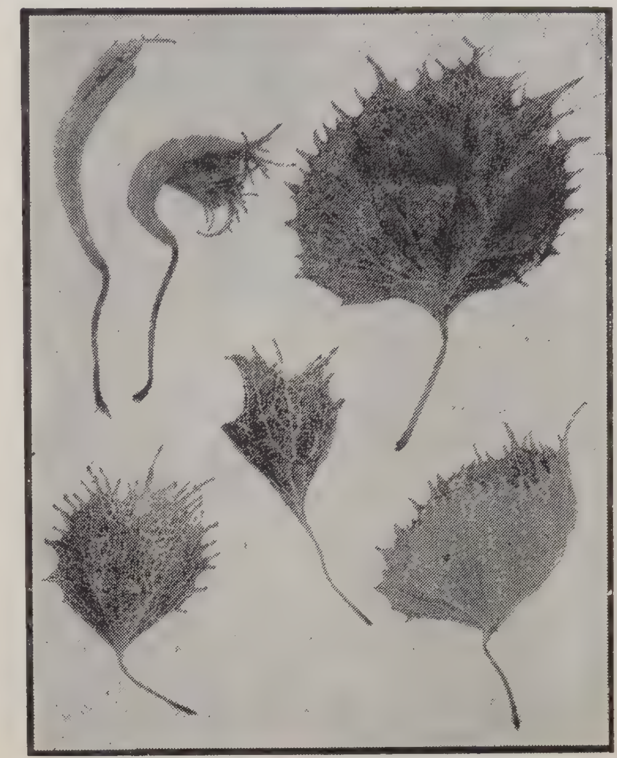

Fig. 2—A range of symptoms produced by 2, 4-D vapour on grape leaves.

During 1949 reports from the field suggested that 2, 4-D vapour had damaged grapes at a considerable distance. The evidence already quoted had established the fact that vapour from this weedkiller is dangerous to some crops. As it was not certain that grapes would suffer in the same way, a small trial was carried out in Auckland. Two established vines of the Albany Surprise variety were generously made available in two private gardens, and treatments were applied in December, 1949. Half of the vine in one garden was enclosed in a tent of japara cloth on a warm afternoon. A thin film of concentrated 2, 4-D dissolved in oil was spread over the bottom of an 8in. dish placed on the floor of the tent. With the flaps of the tent closed the dish was left in position for 19 hours.

In the other garden a vine was growing over a rocky bank. Weeds growing below this vine were treated with an oil solution of 2, 4-D emulsified with water (1 part of concentrate to 100 parts of water), 750 ml. of emulsion being applied. To avoid drift the emulsion was shaken from a hand sprinkler held close to the weeds. This treatment was applied on the same day as the other vine was treated.

Spectacular distortion appeared in leaves of the enclosed vine as the season progressed, but only odd leaves high up on the second vine showed similar malformation.

Symptoms of 2, 4-D Produced Experimentally

Symptoms produced by 2, 4-D on the severely injured vine were as follows. Leaves fully grown at the time of treatment remained outwardly normal (Fig. 1). Within 5 days of exposure to vapour small leaves (up to 1½in. wide) began to turn upward at the edges, rapidly becoming cup shaped. After 12 days cupping was pronounced, and cupped leaves were a paler green than normal. At this stage affected leaves had developed an unusual texture, having lost resilience and become parchment-like. Growing tips of the vine that had been close to the vapour source turned brown and died.

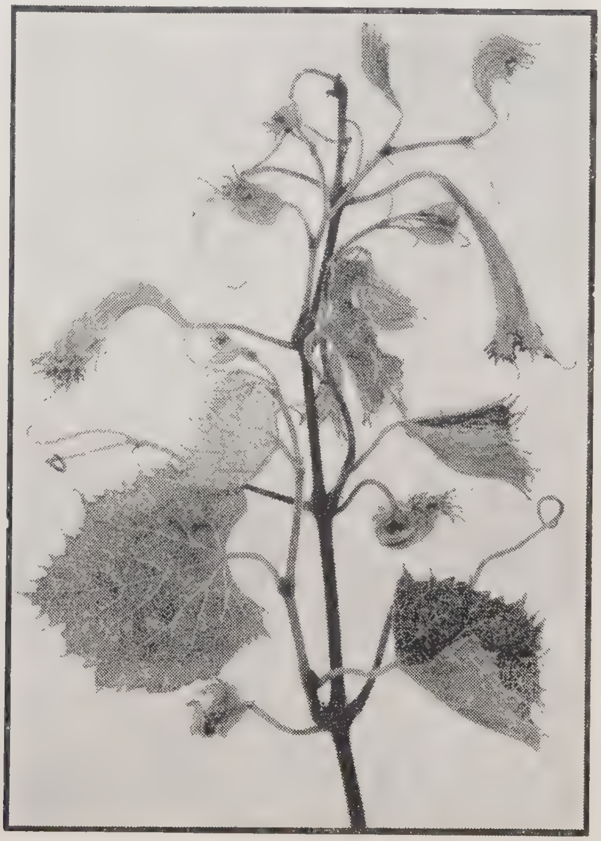

Fig. 3—Albany Surprise shoot from a commercial vineyard that had been exposed to 2, 4-D vapour.

As growth proceeded cupped leaves developed a fringe of irregular projections from their margins (Fig. 2). Leaf veins became distorted, enlarged, and light green so that they stood out as a prominent network. Leaves produced after exposure to 2, 4-D were small and tightly rolled inward (Fig. 2). Some unfolded slightly, but most remained rolled throughout the season. All were pale green, with prominent veins, and with a fringe of distorted projections on the exposed edge (Fig. 2). Foliage on the untreated half of the vine showed no distortion.

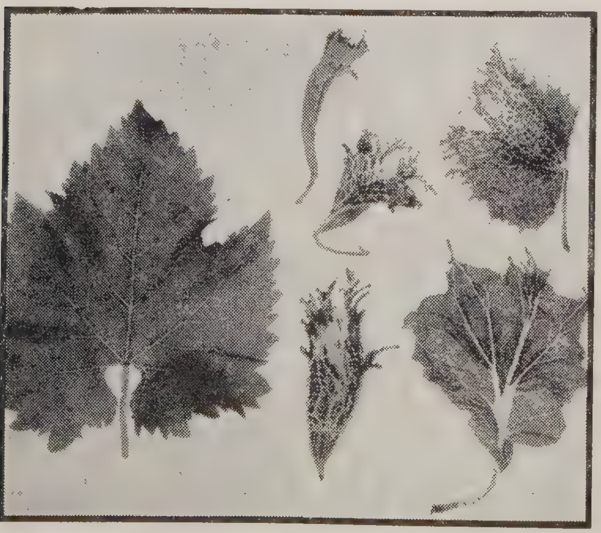

Fig. 4—Symptoms on individual leaves from the same vineyard as in Fig. 3. Healthy leaf at left.

The single fruit bunch carried on the treated portion of the vine had completed flowering before treatment. In contrast to the normal behaviour of Albany Surprise grapes practically all berries on this bunch grew to full size, but were about 3 weeks later in ripening than normal bunches on the other half of the vine.

Injury Observed in the Field

Symptoms on grape leaves identical with those described have been reported from various parts of the North Island. In most cases injury was traced to accidental spraying of vines with 2, 4-D or to spray drift. In three cases where vines received comparatively large amounts, symptoms reappeared in the second season, a phenomenon recorded by Tullis *et al* (1950) in the Chinese Tallow tree, and by several authors on apple trees.

During 1949 an example of widespread damage to commercial vineyards was observed (Figs. 3 and 4). In this instance it seemed impossible that spray drift could have reached the injured vines, as some were about ½ mile from the nearest area treated with 2, 4-D. Only a light wind was blowing in the locality when weedkiller was applied to remove buttercups from pasture. As it has been shown that 2, 4-D vapour alone is sufficient to injure grape foliage, it is reasonable to assume that these vineyards were damaged by vapour drifting across from acres of treated pasture.

Identification of 2, 4-D Injury

Although very small amounts of 2, 4-D can be detected by chemical tests, these cannot be applied to contaminated plant tissue, as the composition of the compound appears to change shortly after application.

Attempts were made to diagnose the presence of 2, 4-D by extracting sap from distorted leaves and rubbing this on to young tomato and grape leaves. In one case where sap from a contaminated tomato plant was applied to a young tomato seedling slight symptoms of the 2, 4-D type appeared on the next two leaves developed. Sap extracted from severely distorted grape leaves at varying times after contamination did not cause any visible distortion of growth when applied to the growing points of grape and tomato.

As no chemical or biological tests are available to assist in identifying 2, 4-D injury, it is necessary to rely on symptoms. These are distinct and characteristic. They are unlike the symptoms of any virus, fungous, or bacterial disease or insect pest of grapes known in New Zealand. The manner in which symptoms appear also helps to distinguish this type of injury from a pathogenic disease. Where an infectious disease is present it is usual to find in the early stages of attack a few plants showing symptoms, and spread occurring at varying rates from these centres of infection. Injury caused by a weedkiller either as drift or vapour will affect a number of plants at the one time, and there will be no further damage unless more 2, 4-D is used in the vicinity. A combination of symptoms and incidence should permit positive identification of this trouble in all cases.

Precautions

It was shown by Mullison (1949) that 2, 4-dichlorophenoxyacetic acid and its sodium salt did not give off any vapour harmful to tomato, bean, or cotton plants, and that five aliphatic esters of this acid were sufficiently volatile to cause marked plant injury. Thus weedkillers containing esters of 2, 4-D are much more dangerous to susceptible plants than those containing the sodium salt or the acid itself, although the two latter compounds will cause severe damage if they reach grapes as drift. Esters of 2, 4-D are usually sold as oil solutions for weedkilling. All these oily preparations should be treated as potential sources of dangerous vapour unless the maker clearly states that no ester is present.

In general no 2, 4-D compound should be used where there is any risk of spray drift reaching grapes. The maximum distance at which vapour from 2, 4-D esters will affect vines is not known. Until further evidence is available 2, 4-D esters should not be used in large quantity within at least 1 mile of commercial vineyards.

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Importance of Good Hive Ventilation

By D. A. BRISCOE, Apiary Instructor, Department of Agriculture, Greymouth

ADEQUATE ventilation of the beehive is important at all seasons; some apiarists are inclined to overlook it. Failure to attend to this matter at the correct times may have serious consequences, including excessive swarming and idleness of foraging bees, resulting in lower average returns, sweating within the hive, mouldy combs, dysentery, and, at times, the death of the colony.

BEEKEEPERS generally are becoming more aware that ventilation is essential to the welfare of the honey bee colony, and conditions within the hive are being improved by the use of different practices and various types of equipment.

It is sometimes thought that during winter when the bees have formed a compact cluster there is little or no activity within the hive and therefore all openings should be reduced to a minimum to conserve warmth. Though this is correct to a point, it is found, especially if the outside temperature is below 57 degrees F., that there is activity within the cluster itself. The structure of a compact cluster is a shell or outer layer of tightly clustering bees 2 or 3in. thick, the centre comprising bees of comparatively loose formation. The bees in the centre are actively engaged in generating the warmth required for survival of the colony during very low temperatures.

Honey bees seldom die of cold provided adequate supplies of honey are available to them, but when temperatures become cold generation of heat is necessary. At such times condensation takes place within the hive if ventilation is inadequate. The breathing and body vapours of the bees under such conditions tend to make the surrounding air moisture laden.

Outside combs may become damp and mouldy, the insides of the supers wet, and in a short time rot takes place at the corners and joints of appliances. Sack mats become waterlogged, making conditions in the hive damp and musty.

To eliminate or prevent such conditions in districts where they occur it is advisable to have an opening of sufficient size to allow air to pass through the hive at all times, thus removing moisture-laden atmosphere.

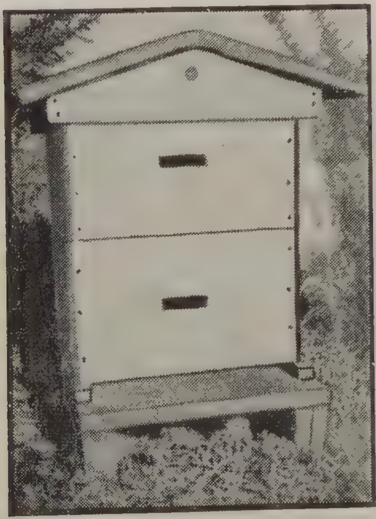
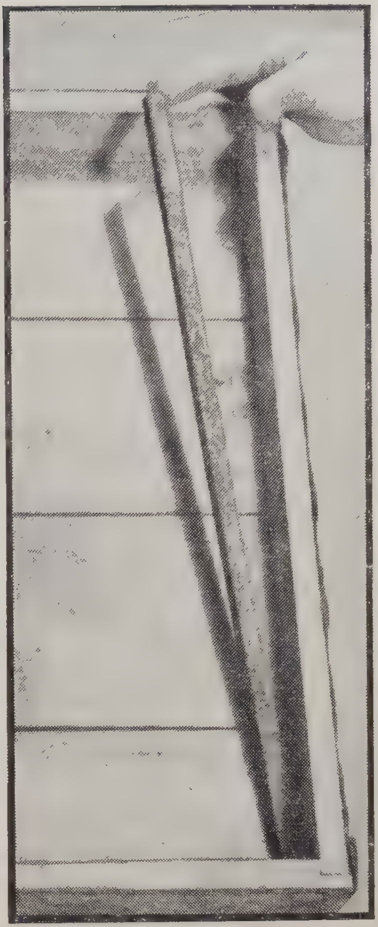


Fig. 1—Gabled-roof hive with 1in. auger hole to assist ventilation.

Air can carry only a small and limited proportion of moisture (water vapour), and if the entrance of a beehive is reduced to a minimum without supplying top ventilation, conditions within the hive will deteriorate considerably in a very short time. As the temperature falls the atmosphere in the hive is unable to retain the water vapour, with the result that condensation is inevitable.

Cold draughts through the hive at this period would of course be detrimental. Many different methods are used for providing a free flow of air through the hive all the year round; in winter to allow the exit of moist atmosphere and in summer to assist in controlling the heat generated in the hive. Some beekeepers prefer to contract bottom hive entrances during winter; others maintain that they should be left open at all times. Before deciding on the method to be adopted, the beekeeper should see if the bees are able to remove damp and musty atmosphere by upward ventilation. Without through ventilation the bees can manage to get the moisture out of the cluster, but are unable to rid it from the hive. One of the oldest and most efficient methods was the use of the gabled roof with a 1in. auger hole drilled in one or both ends and covered with wire gauze (Fig. 1). This type of roof has much to commend it, especially for ventilation, but owing to some disadvantages which it has, mainly experienced during hive manipulations and moving operations, it appears to have lost favour of recent years.

The flat roof is extensively used by beekeepers today. Ease of construction and manipulation and its ability to be made into a double tier stack of colonies in moving operations are only some of the advantages. Perhaps its biggest drawback is that it is usually constructed so that it rests close on the top super and hive mat, preventing sufficient movement of air above the frames to enable moisture-laden atmosphere to be carried away from the colony. The result is that the inside of the roof becomes wet and the mat waterlogged, especially in winter and in districts where there is a big variation in day and night temperatures. Fig. 2 shows a simple remedy. A cleat of wood about ½in. square is fitted down each side of the inside of the lid and tacked in position. Sufficient air movement is then permitted over the top of the frames and allowed to escape through the space between the inside ends of the lid and super. The hive mat could be cut to fit neatly inside the super and rest on the tops of the frames, but if it is cut to outside hive dimensions, the cleat of wood



[*M. R. Flanagan photo.*

Fig. 2—Cleats of wood fitted inside flat hive lid to provide air space.

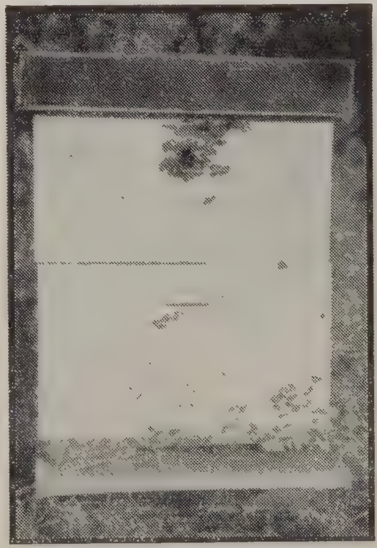


Fig. 3—Position of additional top entrance for bees under certain conditions.

would tend to hold the mat tightly against the super, minimising some of the advantages gained. If standard hive measurements are carefully followed, there should be no fear of robber bees entering by the space between the super and the lid.

The "upper entrance" shown in Fig. 3 is not extensively used, as it may prove an embarrassment to the bees under certain conditions, but it is an advantage in winter in colder climates where heavy falls of snow tend to close the lower entrance for considerable periods.

Another means of supplying through ventilation is by the use of an inner cover or crown board (Fig. 4). This cover, which is used in place of the sack mat, is constructed of 3/16in. timber and has an outer edging of strips of wood ⅜in. x ½in. nailed on both sides, allowing a complete bee-way above the frames. A hole about 2in. square is then cut out of the centre and covered with wire gauze. The use of this cover in conjunction with the flat roof referred to provides excellent all-the-year-round conditions.

With the advancement of the season into the warmer months of summer and the start of the main nectar flow, ventilation once more requires the attention of the apiarist. It is known only too well that inadequate ventilation at this time when a large force of bees is awaiting the start of the nectar flow plays a big part in inducing a prime swarm to issue.

Fig. 5 shows the conditions that may exist when the colony becomes overcrowded, with insufficient room and ventilation to allow the normal progress of the colony. If these conditions are ignored in late spring and summer, swarming and even the breaking down of combs caused by accumulated heat within the hive may result.

During the nectar flow the bees stand at the hive entrance fanning vigorously, creating an air current throughout the hive. Nectar, when gathered by the bees, consists of about 70 per cent. water (sometimes less, according to humidity), several sugars, of which sucrose usually predominates, with a small amount of minerals, etc. It is not intended to deal with the conversion of nectar into honey, that is, sucrose (cane sugar) into levulose and dextrose (fruit sugars), but to deal only with the evaporation necessary to reduce the water content from as high as 70 per cent. to about 17 per cent., which is contained in ripe honey.

The moisture content of honey varies with the types of nectar gathered. Evaporation of this moisture is brought about by the manipulation of the nectar through the mouth parts of the bee, and exposure to the warm atmosphere of the hive. The moisture is carried away by the movement of air in the hive caused by the fanning of bees at the hive entrance. The nectar may be subject to several such manipulations before it is placed in a cell and capped as ripe honey.

Ripe honey contains only about 17 per cent. of water and must be diluted before being consumed as food by the bees. The amount of moisture added by the bees in the diluting process (said to be at least 30 per cent.), together with the moisture content of the honey (approximately 17 per cent.), is eventually expelled by the bees in various ways.

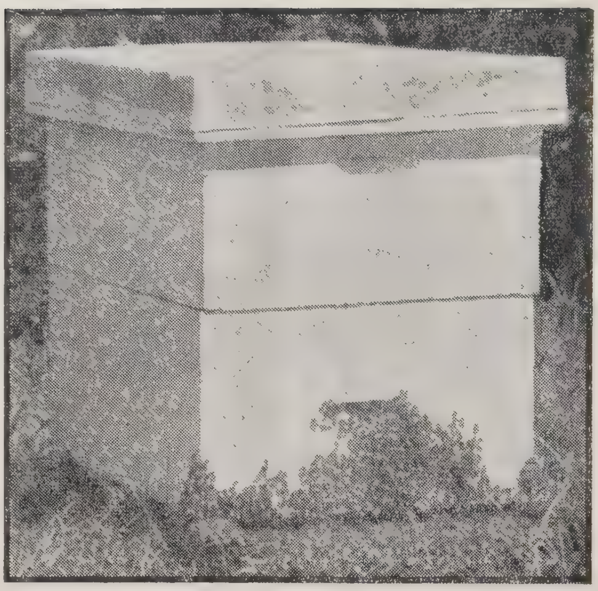


Fig. 5—In warm weather when the hive becomes overcrowded bees cluster outside because of insufficient ventilation.

A percentage is given off by evacuation (cleansing flights) outside the hive, but a large portion must be disposed of by evaporation, or through the spiracles of the bees.

It can be seen that a vast amount of moisture is expelled from the colony during the season, and beekeepers should provide good hive ventilation and should carry out this work judiciously.

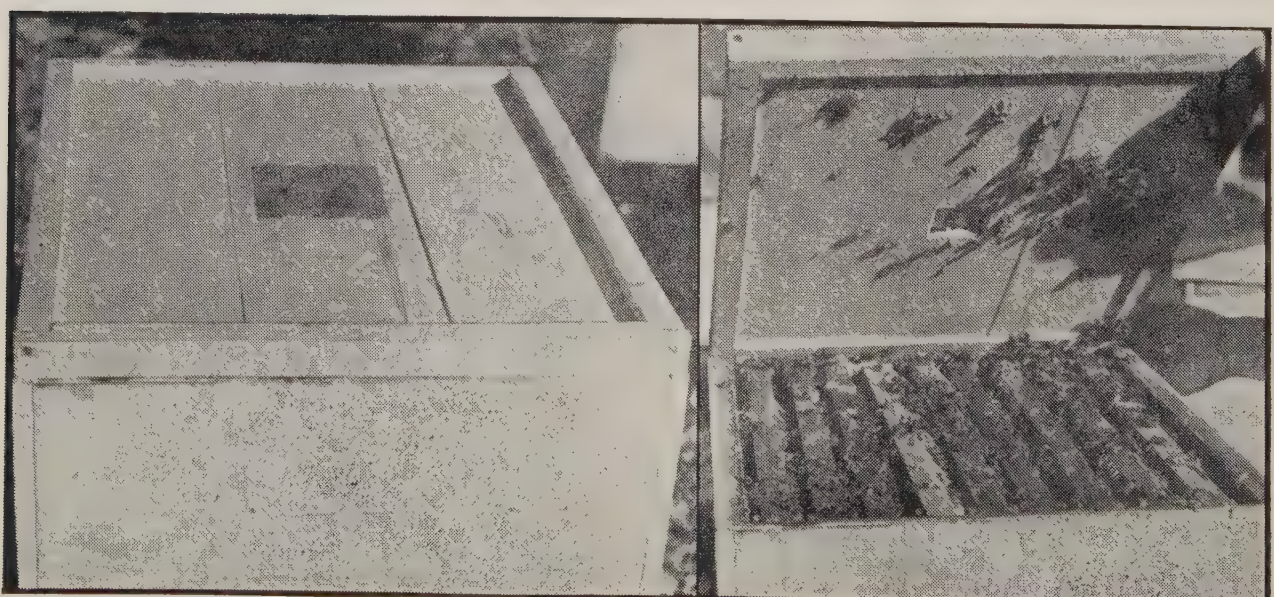
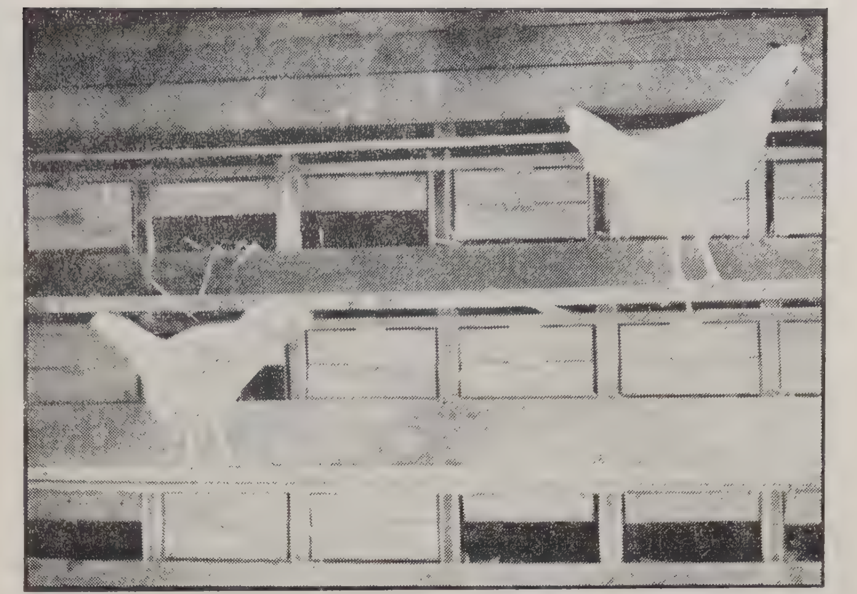


Fig. 4—Wooden inner hive cover showing position of ventilation hole. *[M. R. Flanagan photos.*

Trap Nesting as a Guide to Egg Production



PRESENT high costs of poultry feed and the scarcity of materials for the making of farm equipment have emphasised to many poultry producers that, if a reasonable income is to be derived from egg production, only the best producers should be kept. In this article H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, discusses the advantages of trap nesting on the average poultry farm in enabling uneconomic birds to be detected.

FLOCKS are being culled more heavily and conscientiously than ever before in New Zealand and many producers are taking part in the Poultry Flock Improvement Plan with the aim of improving the type and stamina of their flocks. On many farms this has had an immediate economic effect and the farmers, pleased with the results, have been content with their achievements.

However, by these methods alone the average egg production of the flock on any farm can reach only a certain level. Obviously, egg production in New Zealand has now reached that peak and cannot be expected to rise until breeding programmes are more definite and scientific.

Progeny Testing

Experts the world over are agreed that the only means of improving the flock's average egg production is progeny testing. This involves the recording of much data of tests of both the male and female stock. Fertility, hatchability, incidence of disease, and the ultimate production average of the flock are but some of the details which must be recorded under this method of breeding, which involves much extra work. In a country where most farms are one-man establishments and little suitable labour is available, it is understandable that breeders carrying out progeny testing are comparatively few.

Trap Nesting

For detection of the poor producer trap nesting has been used for many years. Many poultry farmers depend solely on it as a guide to improvement of their flocks and, though it has its limitations, it is a step worth taking. The alternative to trap nesting is single penning, but the high cost of building materials and the large number of pens required make it prohibitive to most poultry farmers.

Trap nesting enables the farmer to ascertain not only the number but the texture and size of eggs laid by each bird. A common method of recording these details is to rule a sheet of paper into squares and write along the top edge the days of the month and down the left-hand edge the leg-band numbers of the birds. When a nest is cleared a mark is made beside the leg-band number and under the date. Any unusual or undesirable features, such as broodiness in Leghorns or disease, should be recorded.

The period for which trap nesting is carried out depends on the labour and time available, but an endeavour should be made to test the birds for 48 weeks. If that is impracticable, a recording taken during the 3 winter months will give much useful information, for in general the best winter layers are usually the best over-all producers. An adequate number of nests should be provided, and to avoid an excessive number of eggs being laid on the floor at least 1 nest to every 4 birds will be necessary, 1 to every 3 being preferable. The traps should be cleared regularly, 1½-hour intervals being sufficient in most cases.

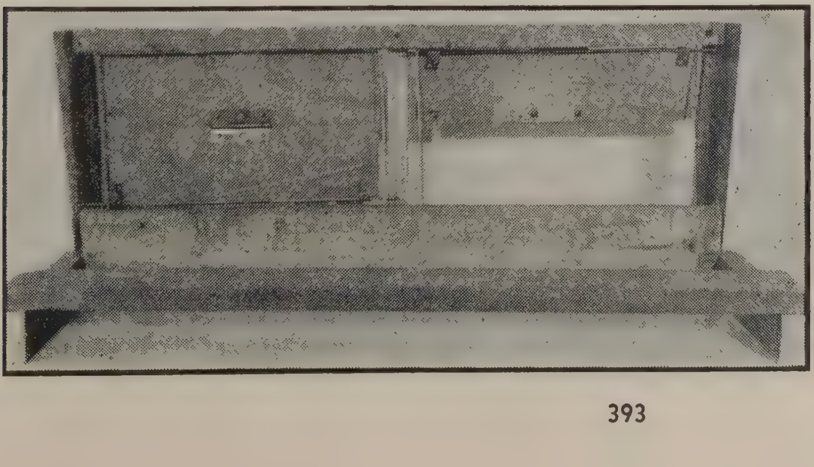
Trap nesting also brings about a desirable docility in the birds because of the frequent handling. Birds of breeds such as Leghorns which are normally rather flighty become quite tame after a few weeks' handling.

Construction of Trap Nests

The trap nests illustrated are very effective and simple to make. The internal measurements of each nest are about 1ft. square and 15in. high. The door is made of two pieces of 3-ply each 11½in. by 3½in. butted together by a 2in. hinge. When set the trap should have an opening of about 4¼in. Pig rings or even single-coil fowl rings can be substituted for the 2in. hinges. The framework on which the traps are hung consists of a piece of 6in. x 1in. and a piece of 1in. x 1in. timber. The narrow batten is nailed to the top of the nest and the larger board forms the lower portion. A piece of No. 8 wire is inserted into the framework at each end of the nest and another piece 13in. long is fastened to the lower edge of the trapdoor. These wires prevent the trap from opening outward and are essential.

The lower half of the door folds up, and the weight of the door against the side wires prevents it from falling. When a bird entering the nest pushes the door back, the lower half falls.

A folding perch should be constructed about 4in. from the traps and 3in. below the bottoms of the doors. This compels the birds to step upward and ensures safe release of the trapdoors.



Recent Research Work

PASTURE PRODUCTION

THE GENERAL LEVEL of pasture production in New Zealand has been raised considerably during the past two decades by regular topdressing and the use of Certified strains of grasses and clovers. Results of recent experimental work by the Extension Division, Department of Agriculture, given on this page illustrate the value of regular topdressing and the productive capacity of certain strains of ryegrass.

REGULARITY OF TOPDRESSING

STRIKING EVIDENCE that regular topdressings are required if pasture production is to be maintained is provided at the Department's Marton Experimental Area by a mowing trial on which dressings were stopped in 1940. The table below compares this trial area and adjacent regularly topdressed pasture.

Though the difference was small for the first 4 years, production then declined rapidly on the untopdressed plot, which in 9 years gave little more than half the production of the adjacent regularly topdressed area. Before topdressings were stopped the plots were limed adequately and had received annual applications of 4cwt. per acre of superphosphate for the previous 8 years. Evidence from other sources suggests that a much more rapid decline in production might be expected on land newly sown or manured less heavily and consistently in the past.

Years since topdressing	Superiority (%) of topdressed pasture
1	Not available
2	5
3	—7
4	6
5	32
6	57
7	73
8	58
9	91

* * * *

SHORT-ROTATION RYEGRASS YIELDS

THE VALUE of short-rotation ryegrass has now been tested in both measurement and field trials. Measurement trials at Marton Experimental Area have shown consistently better yields from short-rotation ryegrass than from perennial ryegrass in winter and spring, though the total yearly production of the two species does not differ greatly. The persistency of the grass under a system of rotational grazing with sheep has been very satisfactory, substantial amounts remaining in the sward for more than 9 years. A sward sown with equal parts of perennial and short-rotation ryegrass has outyielded a perennial ryegrass-dominant sward by nearly 9 per cent. over a 9-year period.

PASTURE MIXTURES

FIELD-TRIAL RESULTS with short-rotation ryegrass may be summarised as follows: Where the annual rainfall exceeds 30in. a desirable mixture for a permanent pasture consists of short-rotation ryegrass 15lb. per acre, perennial ryegrass 15lb., cocksfoot 8lb. (or timothy 5lb.), white clover 3lb., and Montgomery red clover 3lb. For a short-term special-purpose pasture intended to give winter and early-spring feed a seeding of 35lb. of short-rotation ryegrass and 5lb. of Montgomery red clover per acre is recommended. Where rainfall is light short-rotation ryegrass is not persistent or suited to continuous grazing.

* * * *

PERENNIAL RYEGRASS

OTHER RYEGRASS STRAINS tested at Marton Experimental Area include three bred by the Welsh Plant Breeding Station, Aberystwyth. Over a 3-year period the herbage production of these strains compared with that of nucleus perennial ryegrass has been as follows:—

Nucleus perennial ryegrass (N.Z.)	100
Welsh P.B.S. S.101 (pasture hay strain)	56
Welsh P.B.S. S.23 (pasture strain)	76
Welsh P.B.S. S.24 (hay strain)	70

The figures represent the dry-matter yields of the imported strains as a proportion of that of New Zealand perennial ryegrass.

* * * *

FREQUENCY OF DEFOLIATION

A TRIAL is in progress at Marton Experimental Area comparing the effect on pasture yields of cutting at intervals of 1, 2, 3, and 6 weeks. Production figures for the first year are:—

Frequency of cutting	Dry-matter yields (pounds per acre)	Increase (%) over weekly cutting
Weekly	2,980	—
2-weekly	4,284	44
3-weekly	5,029	69
6-weekly	6,770	127

The figures show strikingly the value of spelling pastures between grazings for as long as possible within the limits imposed by the quality of the herbage as stock feed and possible suppression of clover growth by long spelling. In future years this trial should provide useful information about the effect of these cutting intervals on the species composition of the pasture.

* * * *

THERMOPHOS FERTILISER

SMALL QUANTITIES of thermophos, imported from the United States of America, have been tried out recently, and at Rukuhia Soil Research Station a mowing trial gave the following results:—

	3-year dry-matter yields (pounds per acre)
Superphosphate (3cwt. per acre per year)	23,340
Thermophos (3cwt. per acre per year) ..	24,488

Thermophos is made by fusing serpentine rock with ground rock phosphate at high temperatures; it contains about the same amount of phosphate as superphosphate. The difference in yield of 1148lb. per acre shown in favour of thermophos is statistically significant. In this trial thermophos was the only one of 12 forms of phosphatic fertilisers compared which gave significantly better pasture yields than superphosphate.

—*P. B. LYNCH*

Soil Conditions for Lilies

THE chief problem of amateur lily growers in New Zealand appears to be soil management, a problem which seems to result in some measure from a lack of understanding of the requirements of the bulbs. In this month's article for the flower gardener by C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, soil conditions for the culture of most lilies are discussed.

MUCH has been written about the soils in which lilies are supposed to grow, and it is now apparent that much of this information can be disregarded. Old ideas of excavating beds to depths of 2 and 3ft. and filling them with special mixtures of varying parts of loam, peat, leaf mould, and sand are now largely disregarded. In nature lilies do not inhabit rich soils, but normally grow in stony or hungry soils such as those in some of the Himalayan valleys, in mountainous volcanic deposits, in leafy woodland soils, and in similar situations. On the other hand, it does not follow that the best course for the amateur to adopt is to attempt to imitate Nature, because most lilies grow much nearer perfection under cultivation than they do in their wild state.

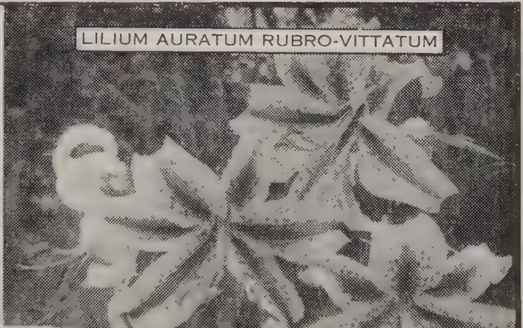
Too much cultivation also may lead to disaster, especially if the gardener is too enthusiastic in applying fertilisers or manures with a high nitrogenous value. Large bulbs and long spikes with numerous flowers may be produced under such conditions, but the grace and true beauty of the flowers are lost.

Drainage Most Important

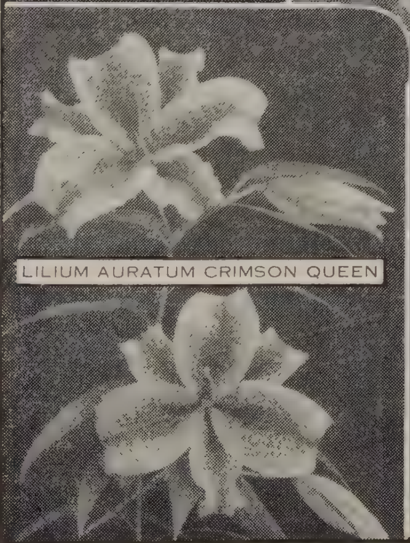
Most important of all is drainage and its relation to the mechanical condition of the soil. Under natural conditions most lilies are assured of ample moisture at the roots during the time of active growth, and during winter may normally lie in a comparatively dry state in loose, stony soil or under a fall of snow. Conditions under cultivation, at least in the temperate zones, are practically the reverse, ample water not being normally available during the growing period and a surfeit being present during winter. The elimination of surplus water during winter is probably the most important aspect of lily culture.

Great care must be taken in improving the mechanical condition for winter drainage to ensure that the soil is not made so open that it dries out almost completely during warm spells in summer, for a cool and moist root run is essential when the bulbs are making growth. A medium must be found between these two extremes: The soil must provide perfect drainage of surplus moisture, but retain sufficient to prevent the soil from drying out completely.

LILIUM PHILIPPINENSE



LILIUM AURATUM RUBRO-VITTATUM



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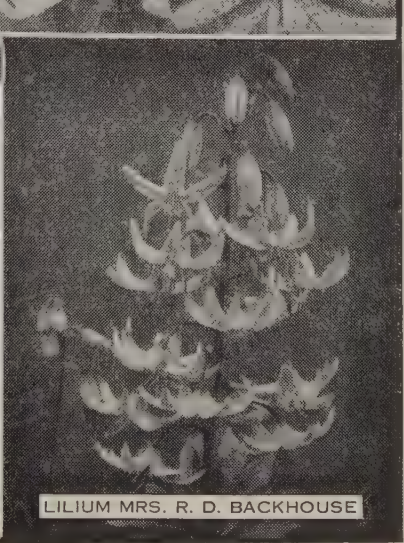

LILIUM MRS. R. D. BACKHOUSE

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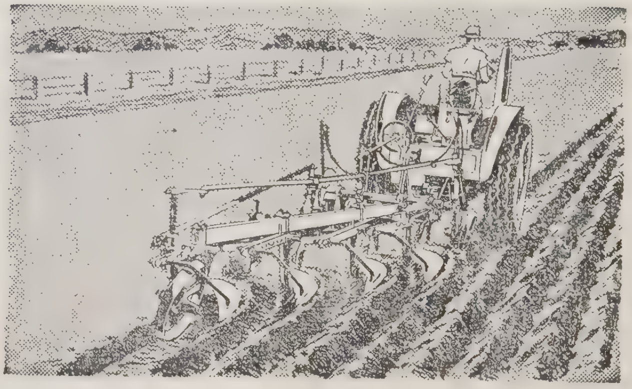

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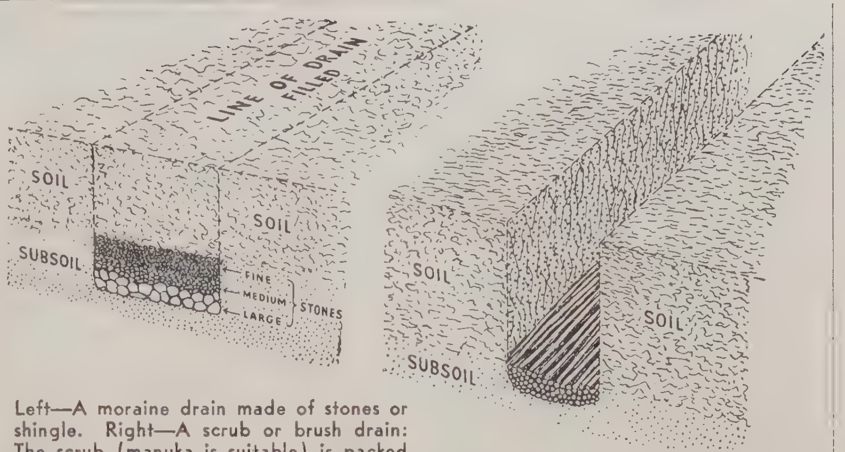


Left—A moraine drain made of stones or shingle. Right—A scrub or brush drain: The scrub (manuka is suitable) is packed tightly in the bottom of a trench and covered with straw or similar material which will pack closely to prevent soil from blocking the drain when it is returned to the trench.

Humus provides the obvious answer to the question of water retention, but that is not its only value in the soil. Clay soils which are naturally cold and binding are greatly improved by the addition of humus, and sandy soils without this constituent are normally dry and tend to produce great fluctuations between warmth and cold. Good loams always contain a good proportion of humus or organic material and without it they degenerate quickly.

On the other hand, a soil can contain too much humus, and any quantity greater than 30 per cent. of the soil can be considered an excess. Such an excess is usually associated with increased acidity. However, this point is not one for great concern, because only where heavy dressings of organic material are made frequently do such excesses seem to occur.

Lime Requirements

Lime is another subject about which there has been great controversy in the past. Many gardeners consider that lime is undesirable for the culture of lilies, but that is not so. Some lilies will never succeed where lime is abundant in the soil, but a great many species are fully tolerant of it and, in fact, will not give of their best without it.

The lily genus does not contain any species which prefer soil conditions of extreme acidity or alkalinity, most of them thriving in soils of about a neutral reaction. Such soils are described technically as having a pH of about 7.0. Soil conditions for the lime-tolerant species can be created with reasonable simplicity by the addition of ample quantities of lime, and those preferring slightly acid conditions can be assisted by the addition of leaf mould and other well-rotted organic materials which have only a slightly acid reaction.

Improvement of Soils

The ideal is a soil about neutral in reaction, retentive of moisture in summer, but sufficiently free draining to rid itself of excess water. However, such conditions occur in very few soil types in New Zealand, but even the worst of soils can be converted with good management to types which will at least be moderately good for the cultivation of lilies.

Deep digging is essential, for it not only assists drainage but also provides the deep root run essential for lilies. This digging should be done where possible to a depth of 2 to 2½ft., but soils are rarely deep enough to allow this. Such digging should not be done when the soil is so moist that it clings tightly to a spade or when it is hard and dry. Autumn is the best time for this cultivation, for the winter rains and frosts can then do their best work in breaking the soil down to a fine tilth through its whole depth.

Lily bulbs should not be planted in deeply cultivated soil which has not been allowed sufficient time to settle properly, for immediately root growth is made the fine root hairs are exposed to too much air below the soil surface and are unable to absorb moisture and nutrients. The ideal is to cultivate the soil some months in advance of planting. The ground need not lie idle during these months, but may be used for a green crop to be dug in later or to be removed and composted. The second course is preferable if it is feared that the nitrogen content of the soil is too high; where the soil is heavy, and especially on clays, the better plan is to dig the green crop in.

The provision of drainage for the removal of excess water is comparatively simple when an entire bed is to be given over to lilies. If the bed is on a slope and consists of heavy soil, a good plan is to raise its general level anything up to 6in. above the surrounding soil. The incorporation of a good quantity of sharp sand or similar material should eliminate the possibility of excess water. On heavy soils or retentive clay soils it is often necessary to construct a simple drainage system consisting of drains of stones running the length of the bed. Such drains should consist of at least an 8in. layer of stones and be about 1ft. wide. An uninterrupted outlet is essential if the drain is to function properly, and nothing could be better than a well-maintained ditch. If a ditch is not available, a drain-away sump can be made by digging a fairly deep hole and filling it with stones of sizes decreasing from bottom to top. The purpose of drains is as much to prevent abnormal rises in the water-table as to drain away excess moisture passing down through the soil, and for that reason they should be at least 2½ft. below the surface.

Humus-forming materials are valuable in assisting drainage of heavy soils, and the leaf moulds and almost neutral peats are best for this purpose. Leaf moulds tend to vary a little in their reactions, and beech- and oak-leaf moulds are generally considered the most suitable for lilies. Lawn clippings and vegetable refuse, provided they are well composted, are also excellent and when completely decayed and almost black are as good as leaf moulds. Animal manures may be used provided they are old, well rotted, and well weathered.

Fresh animal manures must not be used, for they are likely to cause root burning and are often a little too rich in nitrogenous material.

All these materials should be worked in evenly throughout the bed. An apple case full to each square yard is not too much, and on heavy soils a similar quantity of sharp sand should be added. Very fine gravel is perhaps better than sharp sand or builder's sand.

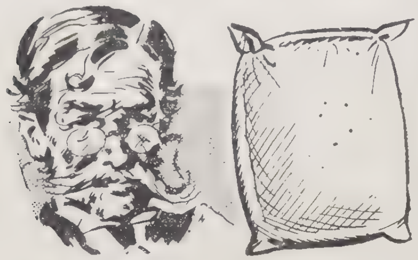
On the lighter soils sand will hardly be necessary, but deep digging and incorporation of the same amount of humus-forming material are equally important.

On light soils the purpose of the humus material is primarily to retain moisture during summer. Dressings on these soils may be increased to as much as 1½ apple cases per square yard.

The only remaining type of soil which must be considered is the normal, medium loam which has been under fairly heavy cultivation for some time, but sometimes this type of soil calls for the greatest amount of care. Hard-and-fast rules cannot be laid down in these circumstances, but where normal types of border plants will grow freely the amount of nutriment already in the soil is likely to be sufficient for the growth of lilies. The addition of fairly small amounts of humus material may be found necessary, but on the whole the main problem will be the improvement and maintenance of drainage.

Manuring at Planting Time

In most cases lilies are planted for permanency. They never give of their best if they are disturbed each season just as they are beginning to take a real hold in the soil. Therefore it is advisable to incorporate some food which is long lasting but which does not provide a surfeit for the bulbs during their early years of life. Bone meal is one of the best materials for this purpose; it does not really become valuable to the roots until about 6 months after it has been worked in, and very few soils will not benefit from a dressing of about 3oz. for each square yard.



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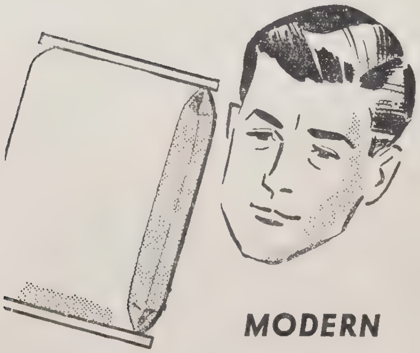

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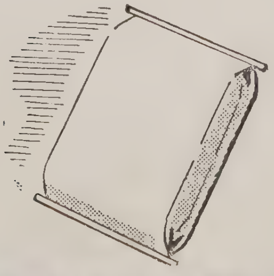

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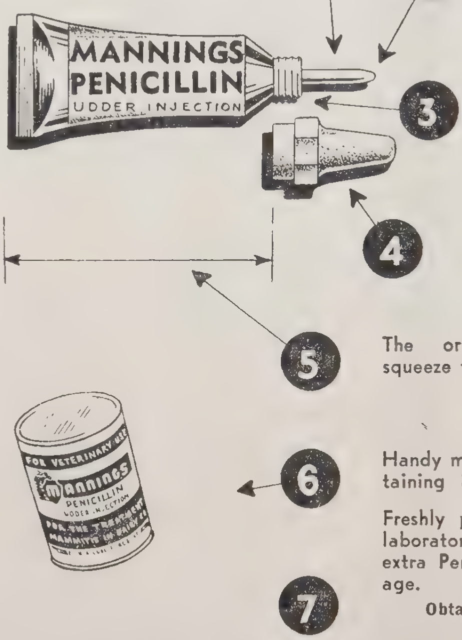
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Preparation of Small Patches

The rules for the preparation of soil in small patches in mixed borders or shrub gardens are much the same, but digging out deep holes for lilies in the midst of an area which in the past has been cultivated to a depth of only a few inches is useless. The result is merely to provide a sump for the drainage of excess water from the surrounding soil. Where deep cultivation of the entire border is not possible, shallow cultivation will have to suffice in order that drainage, probably the most important factor, can be good.

Recommended Varieties

The following list contains most of the species of lily which are tolerant of lime:—

L. albanicum
L. amabile
L. aurantiacum
L. x Backhouse hybrids
L. browni
L. bulbiferum
L. candidum
L. carniolicum
L. carniolicum var. *jankae*
L. chalcedonicum
L. chalcedonicum var. *maculatum*
L. x *dalhansoni*
L. dauricum
L. davidi
L. duchartrei
L. elegans varieties
L. hansoni
L. henryi
L. leucanthum var. *chloraster*
L. longiflorum varieties
L. x *marhan* and varieties
L. martagon and varieties
L. x Maxwill
L. monadelphum
L. pardaboldti
L. pardalinum
L. pomponium
L. x *princeps*
L. pumilum
L. pyrenaicum
L. pyrenaicum var. *rubrum*
L. regale
L. szovitzianum
L. x *testaceum*
L. umbellatum varieties
L. willmottiae

[*Douglas Elliott photo.*

Tuberous-rooted begonias should be coming into flower by December and if necessary, should be fed with liquid manure.

Chrysanthemums should be staked as soon as they are tall enough to require it.

Annuals from late sowings should now be thinned finally. The hoe cannot be put to much good use in the flower borders, so most of the weeding must be done by hand. The tallest and most vigorous are the only types of annuals that should need staking. Only by the removal of all dead flowers and developing seed pods can a continuous display of flowers be guaranteed from annuals.

Bearded irises have horizontal fleshy stems or rhizomes, which develop along the surface of the soil and soon overcrowd each other. For good displays with healthy plants these irises should be lifted and divided every 2 or 3 years. They can be lifted and divided immediately after they have ceased flowering; in fact, under New Zealand conditions this appears to be the best time for the operation. Bearded irises thrive in a rich, well-drained soil and appreciate an annual dressing of 2oz. of superphosphate and 2oz. of carbonate of lime to each square yard of bed.

Begonias of the tuberous-rooted type growing in pots should be coming into flower now and, if necessary, they should be fed with weak liquid manure. Feeding them after the main flowering period has been reached tends to induce weak, useless growth. Unwanted side shoots can still be removed to be used as cuttings. The small side flowers (female flowers) should be removed, as they are of little value and detract from the beauty of the main or terminal flower.

Borders should be given an overhaul during December, marguerites, wallflowers, and other spring-flowering plants which have passed their best being either cut back severely or pulled out. The gaps left can be planted up with late-raised bedding plants such as marigolds.

Bulbs which flower in spring, such as daffodils, hyacinths, and tulips, may be lifted as soon as the leaves have turned brown and withered. They should never be lifted before this because the bulbs depend on the food withdrawn from the leaves for their well-being next season. When the bulbs are lifted the soil should be shaken from them and the foliage left on if it does not fall off readily. They should be placed in a single layer in wooden trays and be put in an airy shed to dry off. If they are stored in heaps, they sweat and are damaged, and exposure to the sun also causes damage. This applies particularly to tulips, the development of which is greatly hampered by exposure of the bulbs to bright sunlight. Dead foliage and loose scales should be removed as soon as the bulbs are quite dry, but pulling twin or triple bulbs apart at this stage may easily result in injury to the basal plate and entry of fungus. Rotten bulbs and those soft at the neck should be burnt immediately, for they are likely to be infected with the pest known as bulb mite. Bulbous irises will start to die down in December, and these too may be lifted and stored as soon as the time comes. These bulbs will be replanted in early autumn, but bulblets may be removed and sown in drills almost straight away; in 2 to 3 seasons they will produce flowers.

Carnations should be layered as soon as the growths are large enough to be handled easily. About 5in. back from the tips the stems should be split up the centres with a sharp knife and be pegged down into the soil with a fairly shallow covering over them. In frost-free districts the perpetual-flowering types are infinitely preferable to the border varieties because they flower for much longer.

Chrysanthemums should be staked as soon as they have grown tall

[*Sparrow Industrial Pictures Ltd. photo.*

Carnations should be layered as soon as the growths are large enough to be handled easily.

enough. Delaying this job is foolish, because winds may take heavy toll of the best stems. The stake should be driven in a little behind the stool and the main stem tied to it. A loose loop of raffia right round plant and stake is an advantage in very windy localities. The stake should reach to about the same height as that to which the flower stems are likely to grow.

Dahlias require much water during their growing season. If the soil becomes dry, it should be given a thorough soaking and a few hours later should be gone over with a hoe to prevent it from caking. Staking should be continued, and further ties will be necessary on stakes put in during November.

Fuchsias will be growing strongly during December and should be watered thoroughly if necessary. They appreciate a dressing of equal parts of superphosphate and sulphate of ammonia watered in at the rate of ½oz. to a gallon of water per square yard.

Herbaceous plants such as lupins, delphiniums, and doronicums should now be gone over in the earlier districts, faded flowers and flower spikes being cut off and the plants generally tidied up. When all flowering has finished, cutting the stems back to the ground and giving a generous mulch of good compost around the plants often produce a further batch of shoots which will flower during late autumn. The second shoots should be thinned out to 2 or 3 per plant.

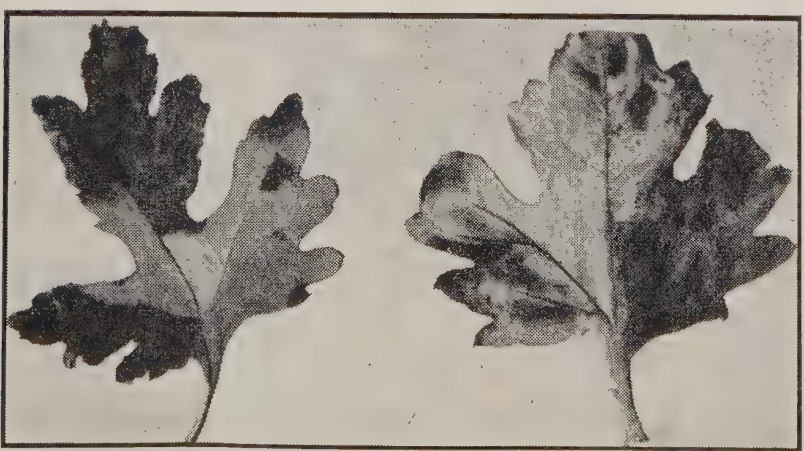
Pinks should be replanted every 2 or 3 years because old plants produce few flowers and look untidy. Pinks can be propagated from December to February by "pipings", which are pieces 2 to 3in. long pulled from the centres of the new shoots. These should be inserted in sand in a cold frame, or in boxes with a sheet of glass to cover them. A sheet of newspaper should be placed over the frame or box to exclude intense sunlight. In 3 to 4 weeks the pipings will have rooted, and they may be planted out to their flowering positions soon afterward.

Pruning of ornamental brooms should be done as soon as they have finished flowering, but cutting into old wood probably would be fatal. The best plan is to shorten back to within an inch or two of its base each shoot that has flowered. New shoots will grow from the stub that is left. Early-flowering heaths and deutzias should also be pruned hard back immediately after they have flowered.

Roses of the climbing and rambling types should have their new growths tied in before they are long enough to sway about and be damaged. Roses of all types can be budded as soon as the bark lifts readily on the stocks.

Seed of quite a number of herbaceous perennials which are cheaply and easily raised in the home garden may be sown during December. Among these are Russell lupins, aubrietias, anchusas, thalictrums, heucheras, and *Alyssum saxatile*. The seeds should be sown in boxes or small open beds and the plants set out in the borders in autumn.

Sweet peas will be in full bloom in December, and every few days all spent flowers and developing seed pods should be removed to keep the plants blooming well. Removal of a few of the side shoots during the growing period of the plants keeps them open and gives adequate room for the development of long flower stalks.



[*Photo News Ltd. photo.*

Parti-coloured or shrivelled chrysanthemum leaves such as these are signs of eelworm attack.

Combating Pests

Aphis or greenfly will be troublesome during December on a very wide range of host plants. Nicotine sulphate sprays should be used at regular intervals to control it.

Chrysanthemum eelworm attack will be showing its effect on the lower leaves of the plants. These leaves will be parti-coloured, shrivelled, or dead, and they should be removed and burnt.

Narcissus flies of the large type are a common and important pest of many flowering bulbs. They are stout, hairy insects, usually marked with red or orange bands. They lay their eggs near the bases of the leaves of bulbous plants toward the end of the growing season of the bulbs. When bulbs are near the surface the flies may crawl down and lay their eggs directly on the bulbs. In either case, after the eggs have hatched, the larvae eat their way into the bulbs, which, even if not killed, are prevented from flowering in the following season. Affected bulbs are shrunken and soft and usually have a corky basal plate. The larvae, which are maggots, may be seen if the bulb is broken open or cut through the middle with a knife.

Narcissus fly larvae remain inside the bulb right through the dormant season, and this fact has a great bearing on the distribution of the pest. As the larvae are completely enclosed within the bulb, heat treatment is the only control measure which is completely effective against them. It consists of immersing the bulbs for 2 hours in water which is maintained at 110 degrees F. Care should be taken not to exceed that temperature or results may prove fatal to the bulbs. This treatment should be given all new stocks of bulbs as a precaution against introduction of the pest to a clean garden.

Thorough cultivation of the soil between the bulbs as soon as the foliage begins to die down, and after it has been removed if the bulbs are not lifted, fills all holes left by dying down of leaves and makes it much more difficult for the flies and larvae to reach the bulbs.

Cooking and Serving the Christmas Ham

A HAM in the store cupboard during the Christmas holiday season enables all visitors, even the unexpected, to be provided with a meal readily and the family appetites can be satisfied with little trouble. Recipes for boiling or baking a ham and suggested methods of using cooked ham are given in this article by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington.

THE method of cooking a whole ham depends on its size. A large one is most easily boiled and smaller hams can be baked satisfactorily. A ham for a small family can be cut in two and each piece cooked separately.

Boiled Ham

If the ham weighs 15lb. or more, it is best cooked by boiling the ham in lukewarm water for 6 hours, or more if it is very dry and highly smoked or salted. Then place it on a wire rack in a large pot or boiling vessel, cover it with lukewarm water, bring it to the boil, and skim any fat off the surface. Maintain sufficient heat under the pot to keep it simmering without boiling until the ham is cooked. Allow about 30 minutes' cooking time for each 1lb. of ham.

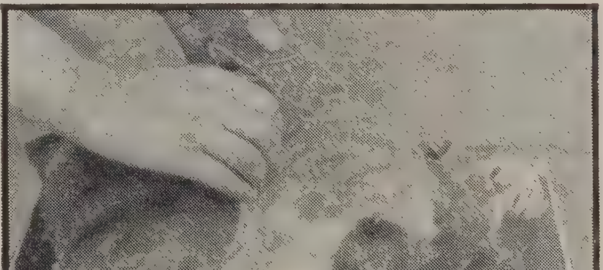
If the ham is cooked in a pot with a small quantity of water around it, a bunch of herbs and 1 or 2 bay leaves may be boiled with it, and a pint of beer, cider, or pineapple juice gives it a mellow flavour if cooked with it. If the ham is being cooked in a large vessel, however, these flavours would be too much diluted and these ingredients should not be added until the ham is being glazed. The ham need not be soaked if it is to be boiled in a large quantity of water.

Hot Boiled Ham

If the ham is to be served hot, lift it from the water as soon as it is cooked, remove the skin, and trim off the fat. If the ham is too large to fit into the oven, remove the small bones at the knuckle end. Cover the ham with breadcrumbs and pat them into the surface fat. Place the ham in a hot oven (400 degrees F.) and baste it with a little liquid fat, sherry, or pineapple juice until the crumbs become brown and crisp. Serve it with a garnish of parsley or cress. For any special occasion pineapple rounds, apricot or peach halves, or tomatoes could be heated in the ham liquor and used as a decoration.

Glazed Boiled Ham

When the ham has been skinned and trimmed pat brown sugar into the surface fat. Score the ham, dot it with cherries and cloves, and place it in a hot oven (400 degrees F.) for 10 minutes. Pour a tin of pineapple juice carefully over it, lower the temperature of the oven to 350 degrees, and baste the ham until the pineapple juice and brown sugar form a thick glaze. Garnish the ham with pineapple and serve it hot or cold.



When the ham is cooked the skin should peel off easily.

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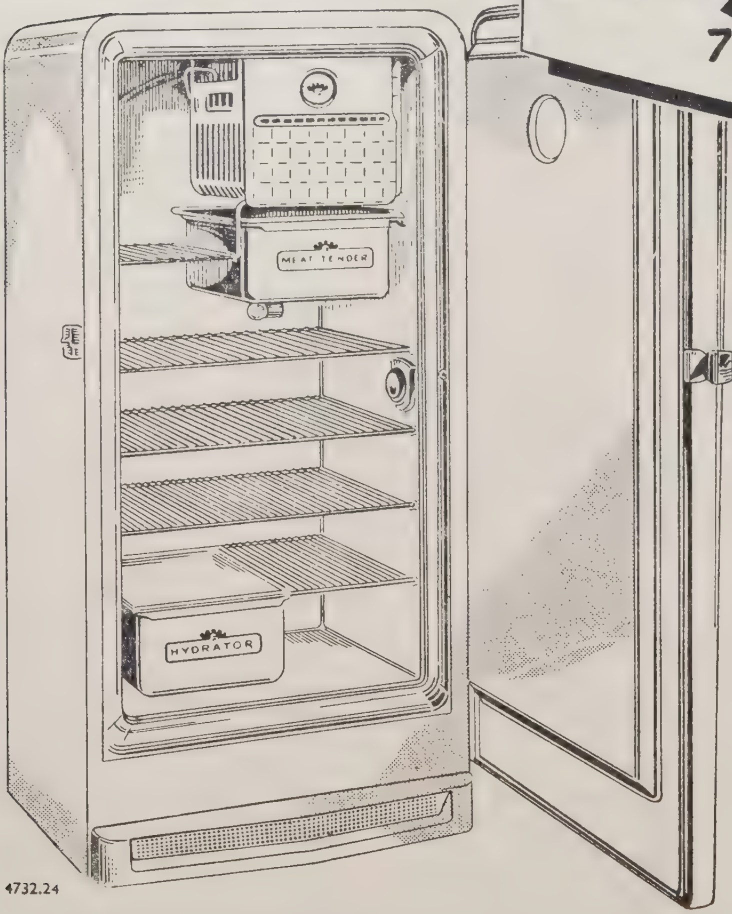

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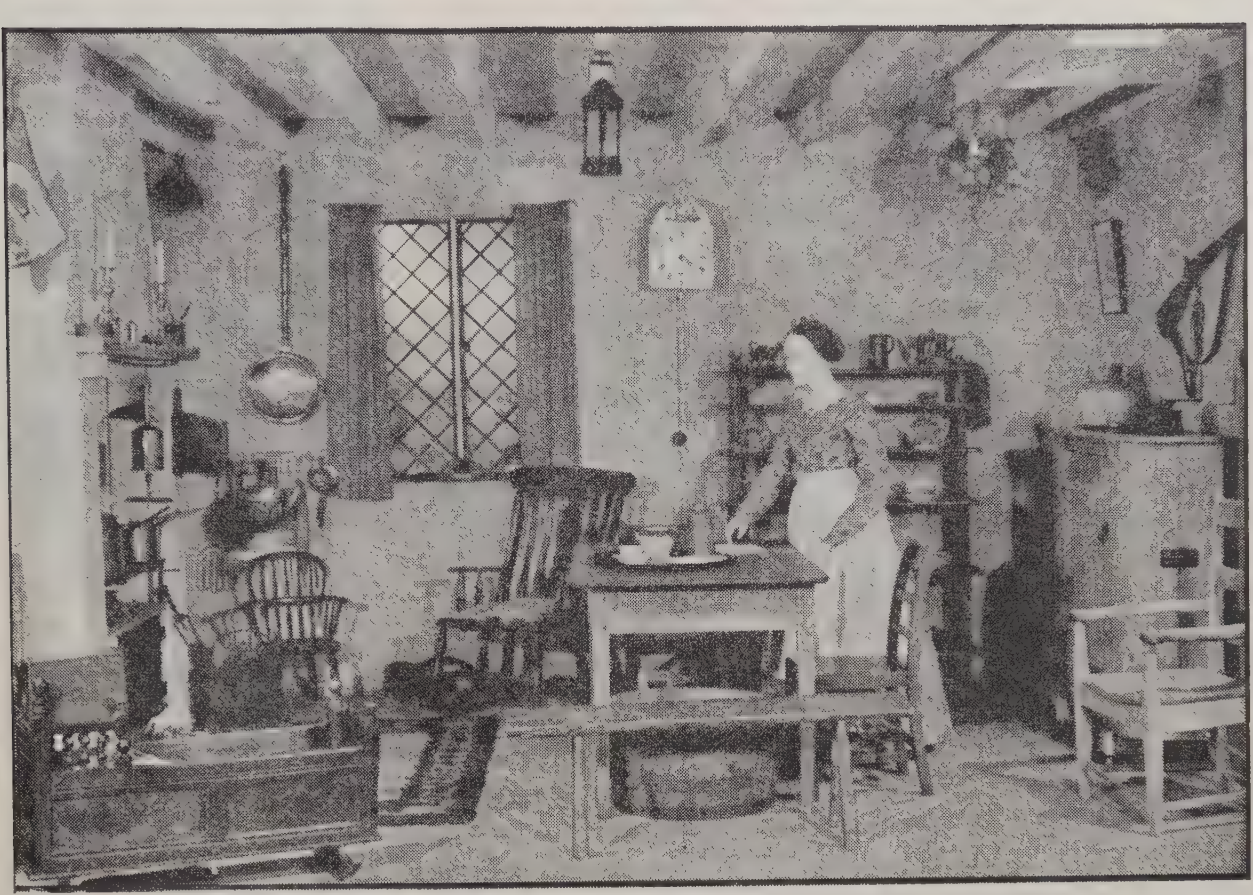

The Farmhouse Kitchen in New Zealand

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MANY of the early settlers in bush districts took pride in selecting and using the finest timber for their houses. Numbers of these houses, characterised by the roughly finished weatherboards, and, unless they have been remodelled, by the high-pitched roofs necessary for shingles, are still in use today. Often all the work had to be done laboriously by hand; the timber had to be sawn, the totara shingles split, and the floor and wall boarding tongued, grooved, and planed. Even bricks would be moulded and burnt in a temporary kiln built on the site, lime for mortar being obtained by burning shells if necessary.

In Central Otago, Canterbury, and other areas where timber was scarce and transport costs high cob, sun-dried bricks, and stone were used with thatched or corrugated-iron roofs.

Wider Use of Colonial Oven

The colonial oven began to replace the camp oven and was installed in many of these new homes. The use of coal- or wood-burning stoves was probably restricted by transport difficulties and cost, for some of the earlier settlers brought their coal stoves as well as their "transportable colonial cottages" with them. Neither coal stove nor cottage seems to have been very satisfactory, however, for the coal stoves had to be remodelled for burning wood, not always with great success, and the immigrants, almost unanimously when writing home, advised their friends not to bring a house with them, although windows, doors, nails, hinges, and other fittings were useful.

The houses, which were comparatively expensive, were supposed to be complete and to require only 2 or 3 days to erect, but they seem to have needed 3 or 4 weeks' labour, and one cottage was described as "being complete at last, after six months". The family had, however, been living in it for some of this time.

The colonial oven, which is reported as first being designed by a Mr. Strachan who settled in the Wanganui district about 1853, and later the coal or wood stove determined to some extent the nature of most farmhouse kitchens built during the next 40 or 50 years.

It consisted of a heavy, oblong, cast-iron box about 3ft. 6in. long set into the lower part of the big brick or stone fireplace so that a fire could be lit underneath as well as on top of it. Flues were placed at either side of the oven to take the smoke from the lower fire up the chimney. Set into the fireplace above the oven were the iron bars for holding the kettle, the hook and chain or sweigh for the heavy iron saucepans, and the big boiler of perhaps 5- or 6-gallon capacity, which was the only hot water supply. Each saucepan had a loop in the centre of the handle to slide through the hook and prevent the saucepan from slipping.

The big stone or brick fireplace containing the colonial oven or the range and surmounted by the high, sturdy, stained or varnished mantelpiece

HEADING PHOTOGRAPH: A reconstruction of a cob cottage kitchen which is typical of those built after the pioneers had become well established on their farms. It shows clearly the variety of purposes for which these kitchens were used.

Baked Ham Slices

Place two slices of ham 1 to 1½in. thick in a shallow covered baking dish, cover them with 1 cup of milk, stock, or tomato or fruit juice, season them, and bake them for 1½ to 2 hours or until they are tender. Remove the cover for the last ½ hour of the cooking time and thicken the juice with 1 tablespoon of cornflour mixed to a paste with cold water. Serve the ham with a garnish of cooked tomatoes.

Grilled Ham Slices

Cut slices ⅛ to ¼in. thick and grill or fry them until they are browned. Serve them immediately with eggs or vegetables.

Baked Ham Cubes

Cut two pieces of ham ½ to 1in. thick into cubes. Place the ham in a casserole, spread it with 1 tablespoon of mixed mustard and 2 tablespoons of brown sugar, and pour ½ cup of milk over it. Bake it in a moderate oven for 30 minutes.

Corn or tomatoes can be added to this dish. If tomatoes are used, their juice can replace the milk.

A baked ham loaf provides an attractive means of serving minced ham.

Baked Ham Loaf

- 1½lb. of minced cooked ham
- 2 eggs
- ½ cup of milk
- 1 tablespoon of mixed mustard
- 1 cup of fresh breadcrumbs
- 1 cup of brown sugar
- ½ cup of vinegar
- ⅛ teaspoon of pepper

Make a sauce by boiling the sugar, vinegar, and mustard in ½ cup of water for 10 minutes.

Mix the ham, eggs, and breadcrumbs with the milk and season the mixture. Shape it into a loaf or into the form of a ham and score the surface with the blunt edge of a knife. Bake it in a moderate oven for 1 hour. Garnish it with cloves and cherries as if it were an ordinary ham. Baste it with the mustard sauce and bake it for another ½ hour, basting frequently. Serve the loaf hot with vegetables or cold with salad, or use it as sandwich filling.

Ham-and-potato Hash

- ½lb. of minced cooked ham
- ½lb. of mashed cooked potatoes
- ½oz. of butter
- ½ teaspoon of dry mustard
- ½oz. of flour
- 1 small onion, chopped
- ½ cup of milk
- Chopped parsley
- Pepper

Melt the butter in a saucepan and cook the onion in it. Add the flour and mustard and cook them for a little longer. Add the milk and stir the mixture until it is boiling. Add the ham and potatoes mixed, season the hash, and heat it. Arrange it in a hot dish and sprinkle it with parsley.

The preparation of ham rissoles.

Ham Rissoles

This is a method of dressing up the ham-and-potato hash for a special occasion. Half the amount made by the previous recipe makes 6 rissoles. When the hash is cold and easy to shape divide it into 6 portions. Roll each portion with the aid of flour, and mould it into a ball, cutlet, cone, or any other shape, using as little flour as possible. Dip the shapes in egg and breadcrumbs and fry them in deep fat until they are golden brown. Drain them and serve them hot.

Ham-bone Stock

The ham bone can be made into a stock which will form the basis of many delicious soups.

- A ham bone
- 2 carrots
- 2 onions
- 2 or 3 sticks of celery
- 6 peppercorns
- 3 cloves

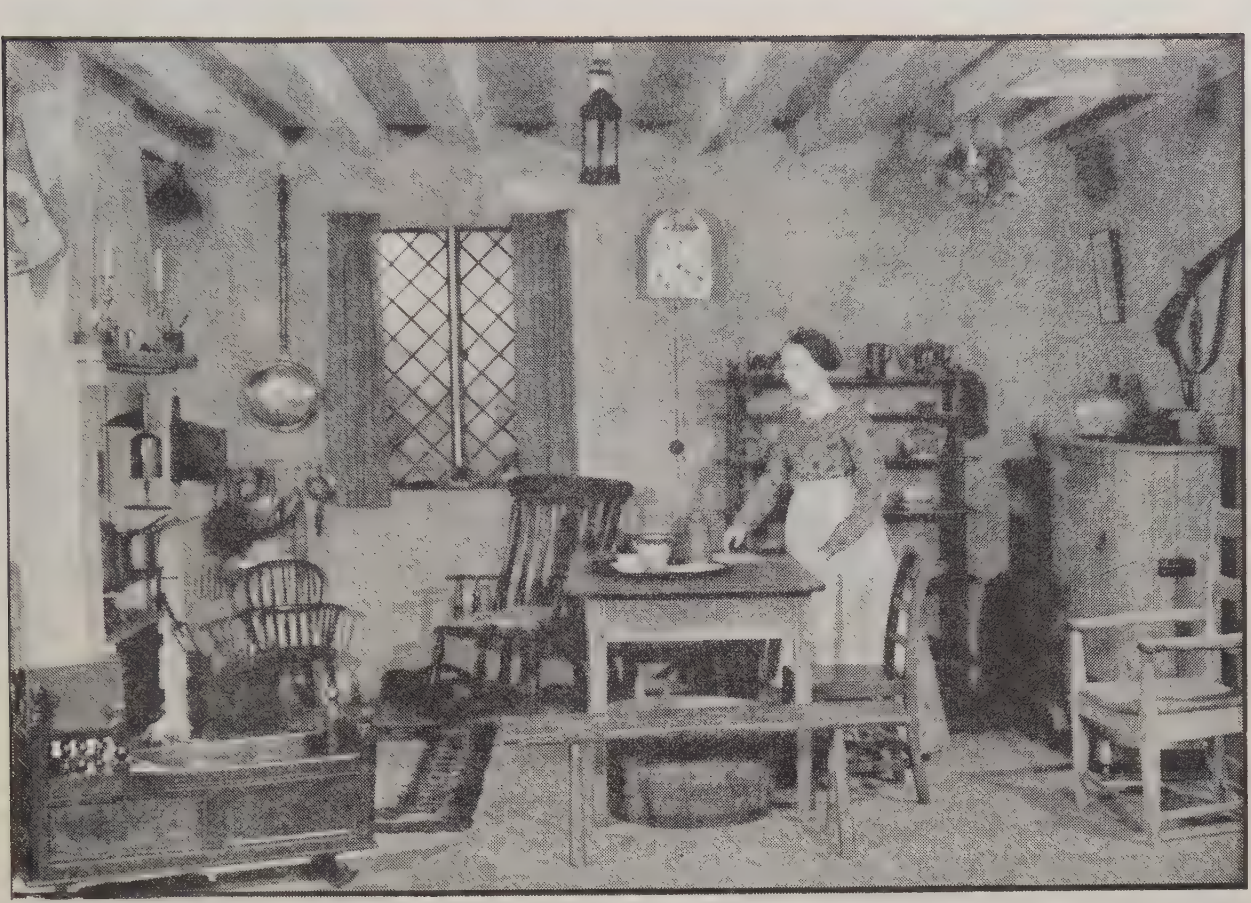
Chop the bone into small pieces. Put it in a quart of cold water with the diced vegetables and cook it for 3 hours, or cook it in a pressure cooker for ½ hour.

Green-pea Soup

- 1 cup of green peas
- 1 pint of ham-bone stock
- 1 tablespoon of sugar
- 1 teaspoon of chopped mint

Cook the peas in 1 pint of water with the sugar until they are tender. Sieve them and add them and the water in which they were cooked to the stock and the mint. Season the soup if necessary and reheat it.

This soup may be made with dried peas soaked overnight if green peas are not in season.



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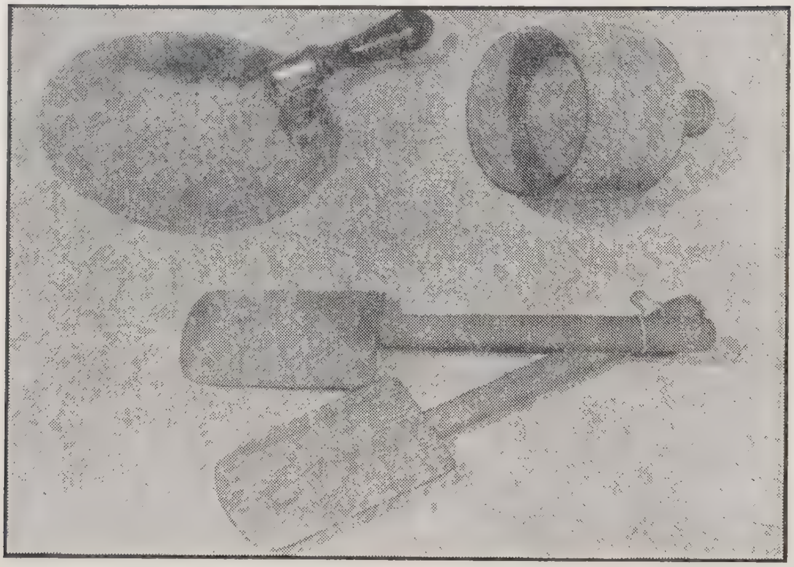


Buttermaking was probably one of the most arduous tasks of pioneer women in dairy farming districts, as there were no dairy factories and few of the labour-saving devices which are available today. Some of the hand utensils used then are shown above. Upper left—Perforated skimmer, by which cream was skimmed off milk. Upper right—Carved oak butter stamp. Lower—Butter pats.

therefore held pride of place in the farmhouse kitchen. The other factors which affected the kitchen's size, shape, and arrangement were in those days most important, though the arrangement would be exasperating to the farm housewife of today. To the pioneer women, however, accustomed to living in rough slab huts, cooking out of doors or in separate huts with mud floors, and carrying water from the nearest creek, sometimes ½ mile or more away, the early kitchens must have seemed convenient and even luxurious.

Space for Variety of Purposes

At first these kitchens were used for a variety of purposes. There was very seldom a bathroom, because until this century they were considered a luxury; for example, "Brett's Colonists' Guide" contains several farmhouse plans, none with a bathroom, and only one, prepared by an architect, had a semi-attached washhouse and coal shed. The kitchen of necessity therefore served its term as a bathroom. It was also a sitting-room for all the family, especially in winter, because it was the only warm room in the house; another room and fire meant extra work for the already-overworked wife of the farmer. In addition the kitchen was the dining-room and, in those days of large families, often a nursery as well, and thus it had to be big enough for all these activities.

With a white pine floor, which was scrubbed daily so that it retained its snowy whiteness but which unfortunately was very draughty at times, its gay rag mats in front of the fire, its stained, brown wooden or white-washed cob walls, sometimes papered with pictures from illustrated newspapers, its big scrubbed deal table under the window, and the long stool on which could be packed many energetic small boys and girls, the old farmhouse kitchen doubtless presents a well-remembered picture to many of the older generation of New Zealanders.

Kitchen Furniture

The table was not only necessary for meals, but was often the only preparation, baking, and "washing up" space in the kitchen, as sinks and piped water supplies inside were not common. In a corner near the back door a space was necessary for the wash basin and can of water for washing when the family came in from working on the farm. The long "kitchen dresser" stood against the wall near the table, rows of cups arranged in order from the everyday ones to the best, near the top, hanging from the shelves, on which were arranged the bright willow-patterned or blue, pink, or brown floral-patterned plates, which were most popular.

Cupboard storage space was at a minimum, and fancy-patterned wall brackets or hooks and nails near the stove for hanging the baking pans and pots were most commonly used, a fashion returning in popularity today. These with a varying number of chairs usually completed the kitchen furniture.

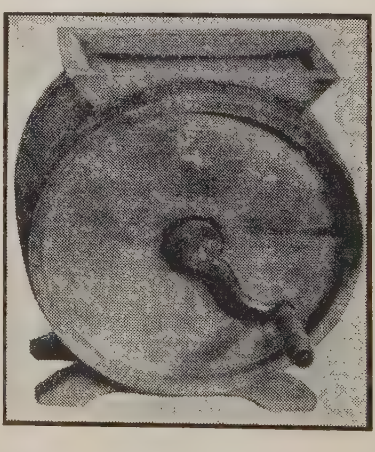
Outside in a cool place was the big meat safe, sufficiently large to hold a sheep, the dairy and storeroom, perhaps a washhouse, and the water tank or well. All water was therefore carried inside in buckets, and as many homes lacked adequate drainage, the water had to be carried out again after baths, dishwashing, or its use for other purposes. Cream had to be set in the big, shallow skimming pans and churned in the old round or cylindrical wooden churns, and the butter had to be made by the housewife in time fitted in between caring and sewing (by hand) for the children, baking, preparing meals, gardening, and housework.

Buttermaking and cheesemaking (rennet for this was usually home made) must have been among the most arduous tasks of the dairy farmer's wife, for cheese and butter factories were unknown in the early years of settlement. Though butter sold readily in new settlements and the few fortunate enough to have cows received a good price for it, the demand was soon satisfied, the isolation of the settlements making transport difficult and costly. For example, in Dunedin in 1849 butter was 2s. a pound, but in Nelson, which had been settled for about 7 years, it had fallen as low as 8d. a pound, with temporary increases after the arrival of immigrant ships.

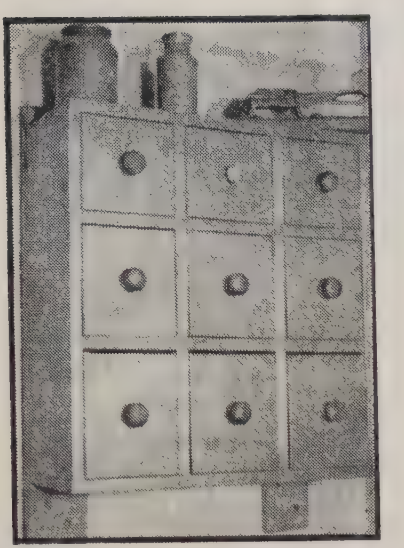
Keen Rivalry in Buttermaking

To make 100lb. or more of butter each week in the slow old wooden churns, work and pat it into 1lb. lots, and stamp it with the carved oak butter stamps that many had brought from England seems a big task today, but was commonplace to early farmers' wives. Grocers and customers soon learnt to recognise these stamps, and as a first-quality product often commanded a premium of a penny or twopence a pound, there must have been keen rivalry among these women, especially during the slump periods, and pride in their abilities as housewives. The development of refrigerated transport in the early 1880's, however, was a stimulus to the growth of dairy factories, and the lot of the dairy farmer's wife generally became easier.

During these years the lack of money, bush fires or floods which sometimes destroyed the work of years, and the need for spending all the money that could be afforded on clearing and improving the farms meant that many farm women had to endure the lack of any labour-saving equipment for far longer than the city or town women. The convention of the times also required, if a choice was necessary, the expenditure of money on ostentatious display rather than on bare essentials which were not seen, and the paradox of a farmhouse with a considerable amount of fancy iron work decorating its generally useless front veranda and with an acute shortage of kitchen equipment was by no means rare.



[*Sparrow Industrial Pictures Ltd. photo.*
The churning of butter was a slower and more tedious operation in the old hand churns of the type shown above than it is in modern hand churns.



In early farmhouse kitchens there was usually no built-in cupboard storage space, so fancy-patterned wall brackets or hanging cupboards with drawers were popular.

Early Labour-saving Devices

That a housewife could have a reasonably convenient kitchen if she were sufficiently ahead of her generation in appreciating its value is apparent from descriptions of trades displays in the Dunedin exhibitions of 1863 and 1886 and from the few conveniently planned homes which were built in pioneering times and which are still in use. Among the exhibits at the Dunedin exhibitions were plumbing fixtures, clothes wringers, hand washing machines, whisk and mixing machines, and even a portable kerosene stove, which is, however, described as "emitting an effluvium which would be objectionable in a drawing room".

As long as colonial ovens and coal or wood ranges, which emitted a good proportion of their heat into the room, were in general use the small kitchenette did not and indeed could not become popular, as it would become unbearably hot and stuffy in summer. Moreover it seems probable that it would be desirable to have a considerable amount of space to manage the heavy cast-iron boilers, pots, and kettles which were in universal use until enamel-ware became available toward the end of the last century; enamel-ware was followed by aluminium-ware, which increased rapidly in popularity after the First World War.

Consequently when the time for improvements arrived the farm housewife, concerned with making the kitchen more like a living-room and in the hope of reducing the congestion which occurred at meal times when the family and frequent guests or the occasional big teams of shearers and other casual workers all arrived in the kitchen together, had a small scullery built on to the house; in this scullery washing up and some serving up could be done in comparative privacy.

Even though this meant much running backwards and forwards with meals and dishes, it probably seemed a very slight inconvenience after perhaps years of obtaining water from an outside pump or tank or even a creek and of washing up with a basin on the kitchen table.

Modern housewives, who would look with dismay at the low sinks, inadequate cupboards, and badly placed windows of those times, would wonder at the lack of thought in planning them, but the surprising fact is the courage of the women of earlier generations in working for years in conditions which today would rarely be tolerated and in rearing their children so that most of them look back not on the drudgery but on the happy family and social life of their childhood.

A pantry and bathroom were usually added at the same time as the scullery or back porch. The pantry provided a convenient storeroom in the house, for, with larger families than is the rule today and slow and expensive transport, far greater quantities of stores were kept than is the present custom and big storage space was necessary.

Changed Attitude to Diet

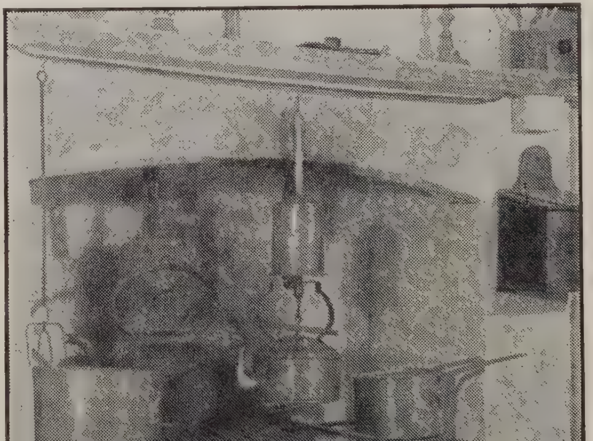
At the same time there occurred, imperceptibly perhaps, a changed attitude toward diet which was unfortunately for the worse and which is still slowly being rectified. White flour was generally easily obtainable after the 1860's, though temporary shortages and gold rushes often caused it to soar in price. It kept better than wholemeal and was much easier to bake with, and in an era when purity and wholesomeness were synonymous with refinement little concern was felt over its greatly inferior nutritive value. Consequently it rapidly replaced wholemeal flour in the national diet, being closely followed in popularity by refined sugar. Milk, eggs, and butter were plentiful and cheap, particularly before the development of refrigeration, so that especially on farms cakes and puddings were relatively economical to make and their consumption, if the increased importation of sugar in relation to the increased population is any criterion, increased greatly. In addition fruit trees and small fruits grew well in most districts, and large amounts of fruit were made into jam or preserved and formed a welcome addition to the menu in winter.

Increased Consumption of Meat

Native birds and wild pork formed a negligible part of the menu, the former being protected by law when their complete destruction seemed likely, and meat consumption increased considerably until New Zealand gained the distinction of being one of the greatest meat-eating countries in the world.

For their vegetables farming families depended almost entirely on what they could produce themselves. Potatoes, generally cultivated in a paddock with a farm crop, were usually plentiful or easily obtainable from a neighbour, but on dairy farms in particular, where the women spent long hours in the milking shed or in making butter and cheese, there was usually little time to spare for a vegetable garden. As a result families on these farms often had no other vegetables than potatoes for weeks in winter. The wives of sheep and crop farmers on the other hand tended to have more leisure time and were able to afford time for gardening, which enabled them to have a varied and better-quality diet. Milk was regarded as a food for babies, young children, and invalids and except in milk puddings and perhaps in tea was little used, a pint a day for an average family being regarded as adequate in early family budget estimates.

It is perhaps interesting to note what is considered a wholesome diet in a "Colonists' Guide" published during this period. For breakfast "bread



The big stone or brick fireplace containing the colonial oven and surmounted by the high mantelpiece largely determined the character of farmhouse kitchens during the second half of the last century.

Windsor chairs of simple and comfortable design which are typical of those brought from Britain by the early settlers.

or dry toast with a moderate quantity of fresh butter, an egg, home-fed bacon or other meat, and a cup of cocoa or tea" was recommended. Dinner consisted of "meat and vegetables, carefully proportioned, plainly cooked, served hot, and properly masticated". Fruit or farinaceous puddings were regarded as desirable additions. The suggested tea meal contained bread or dry toast, butter and jam or marmalade, one or two cups of black tea, and a little fresh green vegetable if it was available.

Compared with the modern concept of an adequate diet, it leaves much to be desired, being very deficient in milk, fruit, and green vegetables and probably also in whole cereals.

Shortage of Domestic Labour

By the beginning of the 20th century pioneering had become history in many parts of the country, especially in the South Island, and a new generation was growing up to whom camp ovens, slush lamps, and slab huts existed only in the stories told by their parents and grandparents.

With a return to prosperity after the depression of the 1880's and 1890's there was a shortage of domestic labour on farms which was only temporarily allayed during the depression of the early 1930's. This meant that a woman could no longer be sure of obtaining help even when she needed it greatly, and as the solution of the domestic help problem became more difficult to find the need for an alternative solution for easing the work of the farm housewife became increasingly apparent.

Consequently the need for reducing the labour in housework and meal preparation resulted in an increased interest in domestic science, cookery in schools, and in the work of the School of Home Science at the University of Otago during the early part of this century.

The advent of electricity in country districts in the early 1920's, and the rapid increase in reticulation until there are now few closely settled districts without electrical power, were big factors in reducing the labour required for housework. Many women as a result of the alterations necessary when electricity was installed in their homes or of the building of new ones began for the first time to think seriously of ways in which their work could be reduced. In the changes which have taken place that of first importance has perhaps been the attempt to alter the rather haphazard arrangement of pantry, scullery, and kitchen to an orderly, efficient one.

Many have chosen the small working kitchenette where sink, stove, and other equipment are in close proximity and where there are few steps wasted in preparing and cooking meals. This type of kitchen, however, is too small to hold more than one or two people at a time, often an inconvenience on a farm. Meals have also to be passed or carried through and served in a dining-room, which may be a disadvantage during seasonal busy periods. Further where there are young children there is insufficient room for them to play in a kitchenette, making supervision more difficult.

Return to Large Kitchens

Further improvements in the design and planning of kitchen equipment resulted in the discovery that a large kitchen need not necessarily be inconvenient, and many new homes contain big living-room-kitchens, like their predecessors of 50 or more years ago, but they are infinitely easier to live and work in.

The number of doors is reduced to a minimum, so that there is a maximum amount of wall space, windows are planned to let in adequate sunlight and air, bench and sink heights are correct for easy and efficient working, stove and sink are close together, and there is sufficient bench space on either side of the sink, stove, and dishwasher, if one is installed, for stacking dishes, pots, and baking pans and for baking and preparing meals. In addition good ventilation above the stove can obviate the smell of cooking, often an objection to a living-room-kitchen, and a semi-recessed dining alcove, or the living portion of the kitchen carefully planned apart from the working portion, will make the service of meals practicable and easy. An open fire or destructor provides heating for the room and makes available an alternative source of heating for water or cooking during power cuts; in fact modern coal ranges are so efficient, clean, and easy to use that many housewives with electricity available prefer them.

New Outlook on Kitchen Planning

Though ease of transport and the development of labour-saving devices and electricity have played a large part in the great improvement made in the average farmhouse kitchen, an equally important cause has been the changed outlook of women and their husbands in the country today. For example, some settlers in newly opened bush country after the First World War lived like the pioneer women of the preceding century in slab and shingle huts of 2 to 4 rooms, carrying water from creeks and wells and washing out of doors in tubs on slab benches because of hopelessly inadequate transport and lack of roads, but they quickly took advantage of any improved facilities. Yet in the Victorian farm home in well-established settlements there was often lack of appreciation of the essential requirements for comfort and convenience, even though good transport by road or rail, many labour-saving appliances, and the facilities for good kitchen planning were available. In typical Victorian tradition every room tended to be packed full of furniture and bric-à-brac, with little thought for its usefulness or the amount of care or cleaning it would require. An exception was the kitchen, which tended to be a repository for old furniture no longer fit for the parlour or drawing-room, which was kept as an impressive show piece for such rare occasions as weddings, christenings, and funerals.

In contrast the modern kitchen tends to be among the most attractively furnished rooms in the house, and the average practical young woman setting up house today prefers, if a choice is necessary, a well-furnished convenient kitchen or kitchen-living-room at the expense of the other rooms rather than a poorly furnished kitchen and expensive living-room suite of furniture typical of about 50 years ago.

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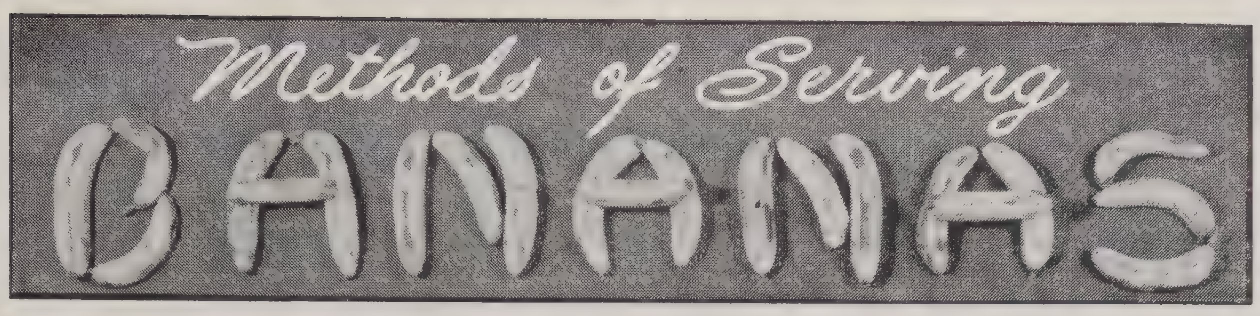


Methods of Serving BANANAS

BANANAS unfortunately are not available in New Zealand as frequently as most people would like, for they are a much-favoured fruit and usually are inexpensive. Few housewives realise in how many ways bananas may be used, so in this article Anna M. Chapman, formerly Rural Sociologist, Department of Agriculture, Dunedin, describes some of the varied uses to which they can be put in both sweet and savoury dishes and either raw or cooked.

AMONG the earliest foodstuffs known to man, bananas were first discovered by the armies of Alexander the Great when they entered the valley of the Indus in 327 B.C. Travellers taking plants back to their own countries spread the cultivation of the plant from Asia to many other tropical countries. Today they are one of the most popular tropical fruits produced and are used almost throughout the world.

Bananas are always harvested green, even when they are to be eaten in the locality in which they are grown. If the fruit is allowed to ripen on the tree, most of the skins break open and the pulp is attacked by insects. Even bananas which reach full ripeness on the tree without splitting are not suitable for eating, because the pulp is mealy and practically tasteless.

The banana has a high carbohydrate content; that is, it contains starch and sugar, which means that it has a high energy value. It contains very little protein, fat, or roughage, but has a significant amount of vitamins B_1, B_2, and C.

Storage and Ripening

The best way to ripen bananas is to store them in a reasonably warm room and leave them to ripen naturally. They should not be stored in a refrigerator, as low temperatures prevent proper ripening and spoil their flavour.

There are three stages in the final ripening of a banana. At the first the peel is yellow except for a slightly green tip; the fruit is then firm and most suitable for cooking and using as a vegetable. The second stage is indicated by an all-yellow peel; the fruit is still sufficiently firm for cooking, but can also be eaten raw. At the fully ripe stage, when the skin is flecked with brown, a banana is in the ideal state for being eaten raw; the flavour is fully developed and the fruit is thoroughly digestible.

The easiest method of mashing bananas is to slice them into a bowl and beat them with a fork, a rotary egg beater, or an electric mixer until they are soft and creamy. Mashed bananas cannot be prevented from turning brown if they are left to stand, so they should be mashed just before they are to be used. However, sliced or cut bananas can be prevented from turning dark by dipping the slices into or sprinkling them with tinned pineapple juice, fresh or tinned grapefruit juice, orange juice, or lemon juice.

Baked, Grilled, or Fried

Baked Bananas

Peel all-yellow or slightly green-tipped bananas and arrange them in a shallow, buttered baking dish. Brush them with melted butter and sprinkle them with salt. Bake the bananas in a moderate oven (325 degrees F.) for 15 to 20 minutes or until they are tender. Served whole or cut crosswise into halves or quarters, they can be used hot as a vegetable or as a dessert.

Grilled Bananas

Peel all-yellow or slightly green-tipped bananas and place them on the grilling rack. Brush them with melted butter and sprinkle them with salt. Place them under direct heat and cook them for 6 to 10 minutes or until they are brown and tender. Serve them hot as a vegetable, whole or cut crosswise in halves or quarters.

Fried Bananas

Peel all-yellow or slightly green-tipped bananas and cut them lengthwise into quarters or halves. Heat 1 to 2 tablespoons of butter in a frying pan over low heat. Fry the bananas until they are tender, turning them to brown them evenly. Sprinkle them with salt if desired and serve them very hot.

Savoury Banana Dishes

Ham Banana Rolls

Spread slices of boiled ham lightly with mustard. Wrap a slice of the prepared ham around each peeled banana. Place the rolls in a shallow, buttered baking dish, pour cheese sauce over them, and bake them in a moderate oven (350 degrees F.) for 30 minutes or until the bananas are tender. Serve the rolls hot with the cheese sauce from the pan poured over them.

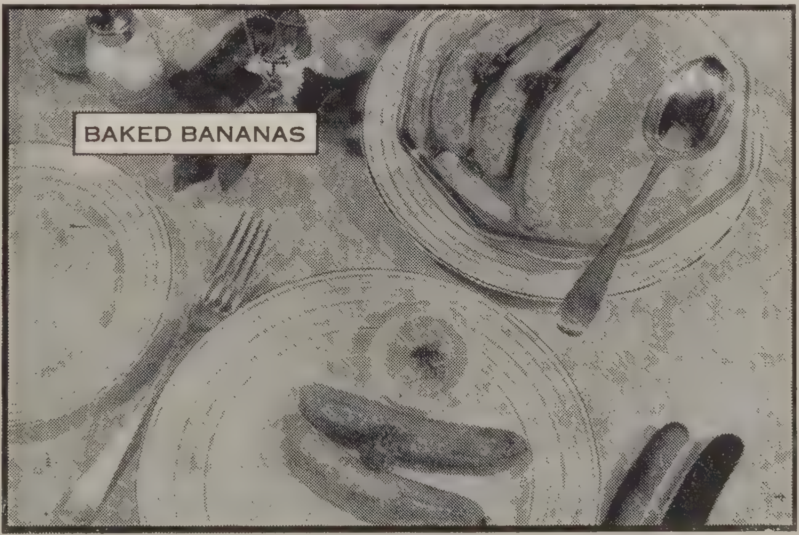
The cheese sauce is made as follows:—

2 tablespoons of butter
2 tablespoons of flour
1 cup of milk
1½ cups of grated cheese
Salt

Melt the butter in a saucepan, add the flour and a pinch of salt, stir the mixture until it is smooth, and cook it for a few minutes. Add the milk gradually while cooking the sauce over low heat. Stir constantly until the sauce is smooth and thick and has boiled. Take the sauce from the heat and add to it the grated cheese. Stir the cheese in until it has all melted, but do not put the sauce back on the heat again, as continued heating causes the cheese to become tough. This recipe makes 1 cup of sauce.

Tomato Tropical

2 large tomatoes
3 tablespoons of finely grated cheese
1 firm banana
Salt
Paprika



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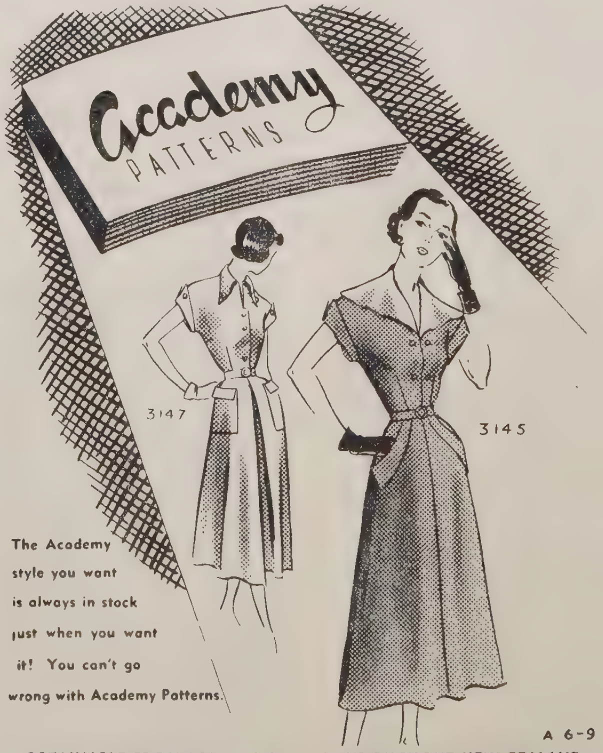

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Cut each tomato crosswise into three thick slices. Peel the banana and cut it into very thin slices. Cover the tomato slices with overlapping slices of banana. Sprinkle the banana with a little salt, the cheese, and a little paprika. Place the dish on the grilling rack about 5in. below the source of heat and grill it for about 10 minutes or until the cheese is melted. Serve it hot with grilled chops, bacon, or scrambled eggs. These quantities make six servings.

Combination Banana Fruit Plate

1 sweet, red-skinned apple
1 orange
1 large ripe banana
Salad greens
5 or 6 berries (strawberries, raspberries, loganberries)

These quantities are sufficient to make two individual salads. Arrange each serving as follows:—

Cut the unpeeled apple lengthwise into halves, and then cut one half into four thin wedges. Peel the orange, slice it crosswise, then cut two slices in halves. Peel and slice the banana. Arrange the fruit on a salad plate in three straight rows, using banana slices for the outside rows. For one end of the centre row use the apple wedges placed so that they overlap with the red skin toward the outside. For the other end use the four half slices of orange placed so that they overlap with the curved side of each piece toward the outside. Garnish the centre with crisp greens and the berries.

Serve the salads with either a sweet or a tart dressing.

Banana, Apple, and Onion Salad

3 ripe bananas
3 sweet apples
1 medium-sized onion
1½ teaspoons of salt
Mayonnaise
Salad greens

Peel and slice the bananas and apples very thinly and chop the onion. Mix them with the salt and mayonnaise. Serve the salad in lettuce cups or on crisp greens. The quantities given make six servings.

Sweet Banana Dishes

Banana Dutch Coffee Cake

1 cup of flour
1¼ teaspoons of baking powder
4 tablespoons of sugar
¼ cup of butter
2 tablespoons of melted butter
1 egg
3 tablespoons of milk
3 firm bananas
1 teaspoon of cinnamon
1 teaspoon of grated orange rind
½ teaspoon of salt

Sift together the flour, baking powder, salt, and 2 tablespoons of sugar, and cut the ¼ cup of butter into them. Beat the egg well, combine it with the milk, and add them to the flour mixture, stirring until the mixture is blended. Turn the stiff dough into a well-greased baking pan (8in. x 10in. x 2in.) and spread it evenly over the bottom of the pan. Peel the bananas, cut them into ½in. diagonal pieces, and cover the surface of the dough with overlapping pieces. Brush the bananas with the melted butter. Mix together the remaining sugar, the cinnamon, and the orange rind and sprinkle them over the top of the bananas. Bake the cake in a moderate oven (350 degrees F.) for about 35 minutes.

Serve the cake hot as a coffee bread or as a hot dessert with cream.

Banana Butterscotch Pie

¾ cup of firmly packed brown sugar
5 tablespoons of flour
½ teaspoon of salt
2 cups of milk
2 egg yolks, slightly beaten
2 tablespoons of butter
½ teaspoon of vanilla extract
3 ripe bananas
1 baked 9in. pie shell

Combine the sugar, flour, and salt in the top of a double boiler. Add the milk slowly, mixing it in thoroughly. Cook the mixture over rapidly boiling water until it is well thickened, stirring it constantly. Cook it for 10 minutes longer, stirring it occasionally. Stir a small amount of the hot mixture into the egg yolks, and then pour it all back into the remaining hot mixture while beating it vigorously. Cook the mixture for 1 minute longer, then remove it from the heat and add to it the butter and vanilla. Cool the filling. Peel and slice the bananas into the pie shell and cover them immediately with the filling. Garnish the pie with slices of banana just before serving it.

Banana Apple Betty

3 firm bananas
2 tart apples
¾ cup of sugar
½ teaspoon of cinnamon
¼ teaspoon of salt
3 cups of soft breadcrumbs
3 tablespoons of melted butter

Peel and slice the apples. Peel the bananas and cut them into ½in. pieces. Combine the fruit, sugar, cinnamon, and salt. Mix the breadcrumbs with the melted butter. Place alternate layers of breadcrumbs and fruit into a well-buttered baking dish, using the crumbs for the top and bottom layers. Cover the dish and bake it in a moderate oven (375 degrees F.) for about 40 minutes or until the apples are tender. Uncover the dish and bake it for a further 5 minutes to brown the crumbs. Serve the sweet hot. These quantities make six servings.

Banana Tapioca Cream

2 tablespoons of tapioca
¼ teaspoon of salt
⅓ cup of sugar
2 cups of milk
1 egg
1 teaspoon of grated orange rind
1 cup of sliced banana

Mix the tapioca, salt, and half the sugar. Heat the milk in a double boiler and add these ingredients to it. Cook the mixture over boiling water until the tapioca is cooked, stirring frequently. Combine the well-beaten egg yolk and the remaining sugar and to this add a small amount of the tapioca mixture, stirring constantly.

The preparation of banana ham rolls, which subsequently are baked with a cheese sauce.

Pour this back into the remaining hot mixture while beating vigorously. Continue cooking the mixture for about 5 minutes, stirring constantly. Fold it into the stiffly beaten egg white and cool it. Add the orange rind and fold in the bananas. Chill the mixture, and just before serving garnish it with freshly sliced bananas. The quantities given are sufficient for six servings.

Banana Prune Whip

¾ cup of prune puree
⅓ cup of sugar
1 cup of thinly sliced bananas
1 tablespoon of lemon juice
2 egg whites
Salt

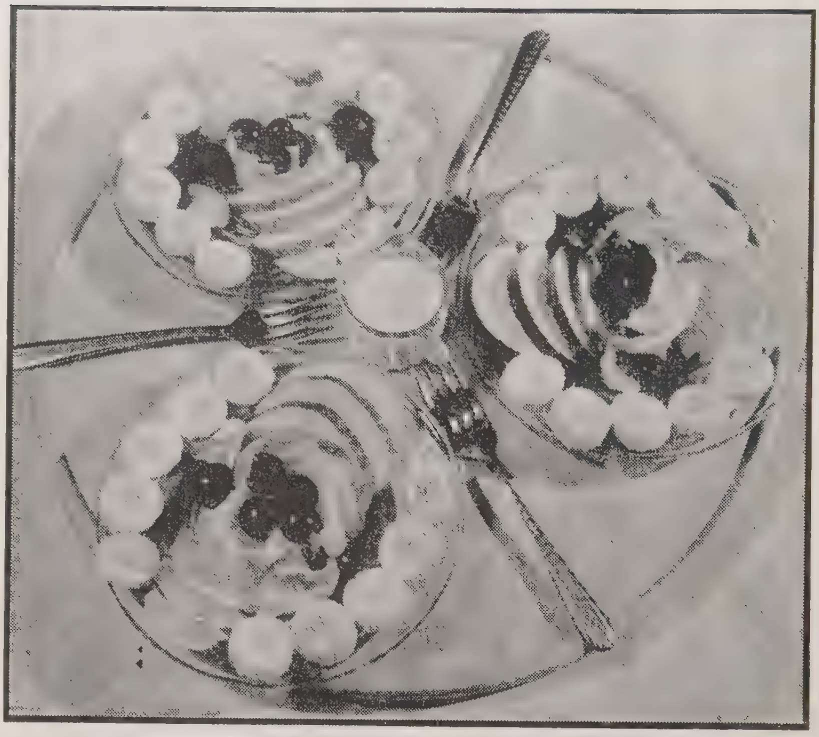
To prepare the prune puree drain slightly sweetened stewed prunes thoroughly, remove the stones, cut the prunes into small pieces, and with a wooden spoon rub the pulp through a sieve.

Mix the prune puree, sugar, and a pinch of salt and cook them over low heat, stirring constantly until the sugar is dissolved. Cool the mixture. Add to it the bananas and lemon juice, mixing them in well. Beat the egg whites and to them add the prune-banana mixture, a little at a time, beating constantly until the mixture is smooth, thick, and fluffy.

Four to six servings can be made from these quantities.

Banana Caramel Ice Cream

1 cup of mashed bananas
2 teaspoons of lemon juice
¼ cup of firmly packed brown sugar
¼ teaspoon of salt
⅓ cup of milk
2 eggs
1 cup of cream
1 teaspoon of vanilla



Three individual servings of combination banana fruit plate. These salads may be served with either a sweet or a tart dressing.

Mix the bananas and lemon juice. Add to them the sugar, salt, and milk, stirring until they are well mixed. Beat the egg whites and yolks separately until they are stiff. Whip the cream until it is thickened but not stiff. Combine the banana mixture with egg whites, egg yolks, cream, and vanilla. Turn the mixture into freezing trays and freeze it in a refrigerator with the indicator set at its coldest position. Stir the mixture every 30 minutes until the ice cream holds its shape, and then continue freezing it until it is firm.

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Banana Dutch coffee cake, which can be served hot as a coffee bread or as a hot dessert with cream.

"FOOD AND HEALTH"

"National good health is an ideal still far from being achieved in New Zealand, as elsewhere", writes Evelyn E. Moore, one of the Department of Agriculture's Rural Sociologists, in the opening chapter of a new publication, "Food and Health". ". . . In the long run the responsibility for improving the national health lies with New Zealand housewives and mothers. . . . This bulletin has been produced in the hope that it will enable her to correct some of the errors in her family's diet, most of which occur unwittingly."

In 88 brightly written and well-illustrated pages Miss Moore, who is a frequent contributor to "The Journal of Agriculture", has made a wide cover of her subject, including many little-known facts and aspects, and the material is presented in a manner which makes for ease of reading and appreciation of the force of her arguments.

"The booklet, which is well written, clearly printed, and effectively illustrated, deserves a wide circulation among housewives and mothers. . . . It will help housewives to use the present knowledge of nutrition to the best advantage of their families", stated "The Press", Christchurch, in a review.

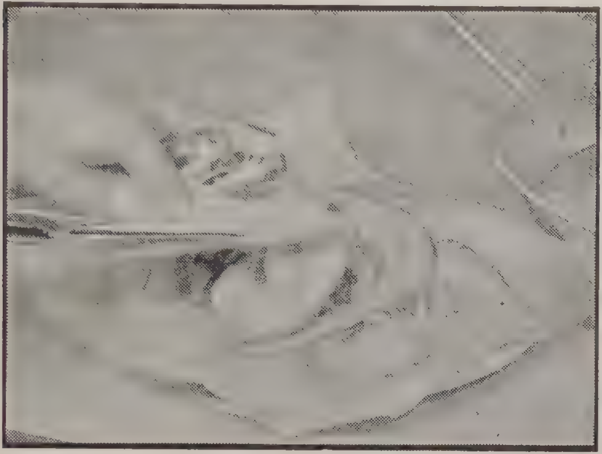
Bulletin 338, "Food and Health", is obtainable from any main office of the Department of Agriculture for 1s. 6d. post free.

◆

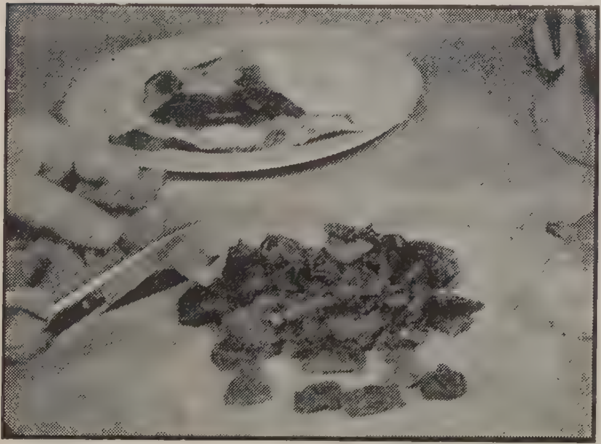
USES FOR SCISSORS IN THE KITCHEN

SCISSORS can be put to many more uses in the kitchen than are commonly thought of. Standard kitchen scissors have serrated edges and jar and bottle openers, but common scissors can be used in the preparation of food, though they must be sharp. Dorothy Johnson, formerly Rural Sociologist, Department of Agriculture, Christchurch, offers some suggestions:—

Scissors provide the answer to the problem of dealing with very new bread, which squashes when sliced with a knife. Pushing the point of the blade into the crust and cutting first around the edge and then through the centre produces a good slice, and the loaf is not left lopsided.



A snip of the scissors removes rind from the breakfast bacon.

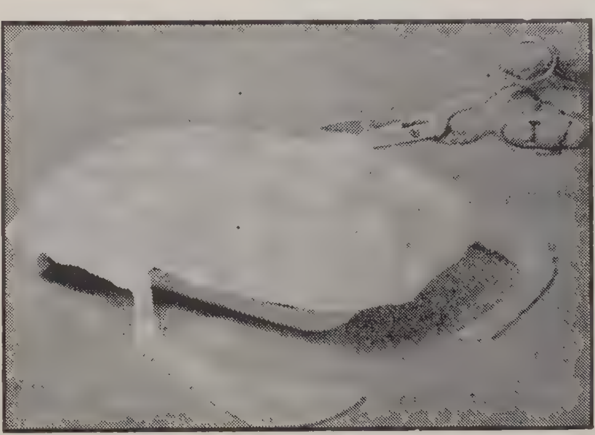


Scissors provide the easiest way of cutting steak for a stew into small and even cubes or cooked meat for a salad into slivers or tiny, thin slices.

* * * *

Yeast doughs are not easy to manage with a knife. If the scissors are dipped in flour, the dough for small buns and fancy bread twists can be cut easily to the right size. For cloverleaf buns three small pieces can be snipped and rested together in a patty pan or on a tray.

If a salad calls for parsley or chives, a handful may be rinsed in cold water and minced or cut finely with scissors. That is also a convenient way of putting that touch of parsley on a savoury or in white sauce.



Trimming the pastry on a pie with scissors instead of a knife causes less stretching of the pastry and therefore less shrinkage in baking, giving a better-shaped pie. Scissors also flute or crimp the edge very successfully.

Scissors are just the tool for cutting dates, raisins, figs, or candied peel or fruits. Dipping the scissors in water occasionally prevents the fruit from sticking to them.

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Knitted Jacket and Cap for a 'teen-age Girl

PATTERNED in red, yellow, white, and black on a background of grey, this cheerful jacket and cap would be a welcome addition to the knitwear in any 'teen-age girl's wardrobe. The instructions given in this article are for a jacket 24½in. long with a bust measurement of 36in. and a sleeve seam of 14½in. The set requires a total of 16oz. of 3-ply wool—11oz. of grey, 2oz. of red, and 1oz. each of yellow, white, and black. Also needed are six buttons for the jacket, and muslin and wide ribbon for the cap lining.

THE jacket is worked on two No. 9, two No. 11, and two No. 13 knitting needles, and the cap on two No. 14 needles. The tension should be 8 stitches to the inch over stocking stitch plaid pattern on No. 11 needles and 9½ stitches to the inch measured over "Rebecca stitch" on No. 9 needles.

Abbreviations used are: K., knit; p., purl; st., stitch; st. st., stocking stitch; rep., repeat; cont. continue; patt., pattern; inc., increase; dec., decrease; tog., together; beg., beginning; sl., slip; p.w., purlwise; wl. fwd., wool forward; wl. bk., wool back; gr., grey; rd., red; yl., yellow; bl., black; wh., white.

Right Front

With No. 9 needles and grey wool cast on 90 st. and work in Rebecca stitch thus:—First row: K. 1, * wl. fwd., sl. 1 p.w., wl. bk., k. 1. Rep. from * to last st., k. 1. Second row: K. 1, * sl. 1 p.w., wl. fwd., p. 1, wl. bk. Rep. from * to last st., k. 1. These 2 rows form the pattern.

Cont. in patt. until work measures 1in., ending with a row on the right side (a second row). Next row: * P. 2 tog., patt. 4. Rep. from * to last 12 st., p. 2 tog., patt. 10 (76 st.).

Break off grey wool and sl. first 10 st. of next row on to a safety pin for front border.

Change to No. 11 needles and work the plaid pattern in st. st. (1 row k., 1 row p.) on remaining stitches.

The single vertical white and black stripes are not knitted in with the plaid pattern, but are worked in chain stitch on to the fabric afterward. When working the plaid pattern do not weave wools at the back of the work, but strand across, and where colours change at the same place in two or more rows always twist wools at the back of the work to prevent a hole.

The plaid pattern is worked thus:—First row: * K. 4 yl., 3 rd., 4 yl., 4 rd., 3 yl., 4 rd. Rep. from * to end. Second row: * P. 4 rd., 3 yl., 4 rd., 4yl., 3 rd., 4 yl. Rep. from * to end. Third row: As first row. Fourth row: As second row. Fifth row: As first row. Sixth row: With bl. p. to end. Seventh row: As first row. Eighth row: As second row. Ninth row: As first row. Tenth row: As second row. Eleventh row: As first row. Twelfth row: * P. 4 gr., 3 rd., 4 gr., 4 rd., 3 gr., 4 rd. Rep. from * to end. Thirteenth row: * K. 4 rd., 3 gr., 4 rd., 4 gr., 3 rd., 4 gr. Rep. from * to end. Fourteenth to sixteenth row: Rep. twelfth and thirteenth rows once, then twelfth row again. Seventeenth row: With bl., p. to end. Seventh row to twenty-second row: Rep. twelfth and thirteenth rows twice, then twelfth row again. These 22 rows form the pattern.

When the 22 rows have been worked once, cont. in patt. Dec. 1 st. at end of next and every following tenth row until 60 st. remain. Then cont. straight until work measures 8in. from cast-on edge, ending with a row on wrong side.

Change to No. 13 needles and cont. in patt. until work measures 10in. from cast-on edge, ending with a row on wrong side.

Change to No. 11 needles and cont. in patt. Inc. 1 st. at end of next and every following tenth row until 66 st. are on the needle, working extra st. into patt. Then cont. straight until work measures 16in. from cast-on edge, ending at side (shaped) edge.

Shaping the armhole: Keeping the continuity of the patt., cast off 5 st. at beg. of next row, then dec. 1 st. at armhole edge in every row until 49 st. remain. Cont. straight in patt. until work measures 22in. from cast-on edge, ending at front edge.

Shaping the neck: Cast off 2 st. at beg. of next row. Dec. 1 st. at neck edge in every row until 39 st. remain. Then dec. 1 st. at neck edge in every alternate row until 36 st. remain. Cont. straight in patt. until work measures 24½in. from cast-on edge, ending at armhole edge.

Shaping the shoulder: Cast off 9 st. at beg. of next and alternate rows until all stitches are cast off.

Left Front

Work as for right front until work measures 1in. from cast-on edge, ending with a row on right side. Next row: Patt. 10, p. 2 tog., * patt. 4, p. 2 tog. Rep. from * to end (76 st.).

Break off grey wool, change to No. 11 needles, and work first row of plaid patt. across the first 66 st. Sl. last 10 st. on a safety pin for front border, then cont. in plaid patt. until the 22 patt. rows have been completed once. Keeping the continuity of the patt., dec. 1 st. at beg. of next and every following tenth row until 60 st. remain. Cont. straight until work measures 8in. from cast-on edge, ending with a row on wrong side.

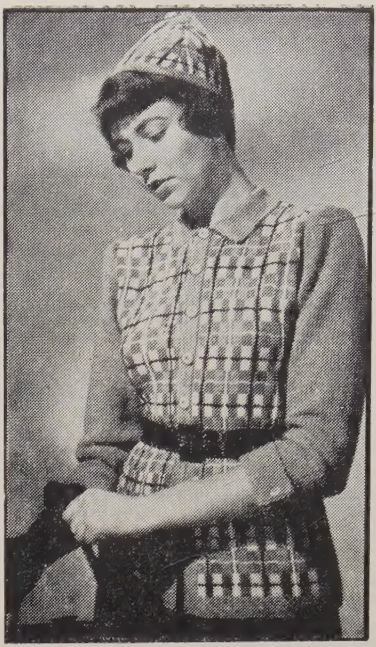
Change to No. 13 needles and cont. in patt. until work measures 10in., ending with a row on wrong side.

Change to No. 11 needles and cont. in patt. Increase 1 st. at beg. of next and every following tenth row until there are 66 st. Then cont. straight until work measures 16in. from cast-on edge, ending at side edge.

Shape armhole and complete to match right front.

Front Borders

With right side of work facing for first row and using No. 9 needles and grey wool cont. in Rebecca stitch on the 10 st. from safety pin at lower edge of right front until border measures 9in. from cast-on edge, ending with a row on wrong side.



Make a buttonhole thus:—Next row: Patt. 3, cast off next 4 st., patt. to end. Next row: Patt. 3, cast on 4, patt. 3. Cont. in patt. making further buttonholes in the same way at intervals of 2½in. from cast-off edge of previous buttonhole until there are 6 buttonholes.

Work a further ½in. in patt. Cast off. Border should be same length as front edge to beg. of neck shaping.

Work left front border in same way but omit buttonholes.

Back

With No. 9 needles and grey wool cast on 170 st. and work in Rebecca stitch for 3in., ending with a row on wrong side.

Cont. in Rebecca stitch. Dec. 1 st. at each end of next and every following tenth row until 154 st. remain. Cont. straight until work measures 8in. from cast-on edge.

Change to No. 11 needles and cont. until work measures 10in., ending with a row on wrong side.

Change to No. 9 needles and cont. in Rebecca stitch. Inc. 1 st. at each end of next and every following tenth row until there are 170 st., working extra st. into patt. Then cont. straight until work measures 16in. from cast-on edge.

Shaping the armholes: Cast off 6 st. at beg. of next two rows, then dec. 1 st. at each end of every row until 130 st. remain. Cont. straight until work measures 24½in. from cast-on edge.

Shaping the shoulders: Cast off 11 st. at beg. of next eight rows. Cast off remaining stitches.

Sleeves

With No. 9 needles and grey wool cast on 86 st. and work in Rebecca stitch until work measures 2in., ending with a row on wrong side. Inc. 1 st. at each end of next and every following eighth row until there are 126 st.,

416—JACKET AND CAP . . .

working extra st. into patt. Then cont. straight until work measures 14½in. from cast-on edge.

Shaping the top: Keeping the continuity of the patt., dec. 1 st. at each end of next and every following third row until 82 st. remain. Then dec. 1 st. at each end of every row until 50 st. remain. Cast off 6 st. at beg. of next six rows. Cast off remaining stitches.

Cuffs

With No. 9 needles and grey wool cast on 104 st. and work in Rebecca stitch for 1in., ending with a row on wrong side.

Make buttonholes thus:—Next row: Patt. 5, cast off next 4 st., patt. to last 9 st., cast off next 4 st., patt. to end. Next row: Patt. 5, cast on 4, patt. to last 5 st., cast on 4, patt. 5.

Cont. in patt. until work measures 3in., ending with a row on wrong side, then make 2 more buttonholes in the same way as before.

Work a further 1in. in patt. Cast off.

Collar

With No. 9 needles and grey wool cast on 24 st. and work 16 rows in Rebecca stitch. Seventeenth row: Patt. to last 8 st., turn. Eighteenth row: Patt. to end.

Rep. these 18 rows until work measures about 13in., ending with an eighteenth row.

Work a further 16 rows in patt. Cast off.

Making up

Press work lightly with a hot iron and damp cloth.

Embroider the black and white vertical stripes in chain stitch to correspond with horizontal stripes.

Sew front borders to front edges and sew on buttons to correspond with buttonholes. Sew a press stud at top edge of front border on either side of border to fasten neck.

Join side shoulder and sleeve seams and sew in sleeves with seams to side seams.

Fold cuffs in halves and sew them to sleeve edges, leaving 1in. free at each end, then turn them back. Make link buttons to fasten cuffs.

Sew on collar with shorter edge of collar at neck edge. Press all seams.

Stitch round double buttonholes on cuffs.

The Cap

With No. 14 needles and grey wool cast on 88 st. and work ¾in. in k. 1 p. 1 rib.

Cont. in plaid patt. as for fronts of jacket, shaping thus:—First row: Patt. to end. Second row: Work 2 tog., patt. to last 2 st., work 2 tog. Rep. these two rows. Fifth row: Patt. to end.

Rep. these five rows until 12 st. remain, then rep. first 3 rows again. Cast off.

Work two more pieces in the same way.

Press work lightly with a hot iron and damp cloth. Join the three pieces together by machining ½in. seams. Press seams. Line the cap with stiffish muslin, then with ribbon to neaten it.

"Carrier" Yarn Makes Possible Still Finer Wool Materials

In repose the body requires greater assistance to retain its natural warmth than when it is active, and the history of clothes shows that wool has often found favour at bedtime. By modern standards, the heavily draped 4-poster beds and voluminous night clothes of previous generations may appear rather elaborate, but bedrooms were usually colder and more draughty in those days, and the choice of flannel, whether red flannel or not, was then eminently sensible.

The woman of today is much more fortunate. Wool has moved with the times, and exquisite nightdresses are being designed in new wool fabrics which, though fine and light, have all the natural protective virtues of wool and wash without shrinkage. There will be warm materials for winter and gossamer-light fabrics for summer, all with the softness of pure wool. A new range of sheer wool fabrics is made possible with the discovery of a new "carrier" yarn, alginate, a seaweed thread used to reinforce wool yarns so fine that they could not otherwise be woven, and which dissolves when soaked in alkali, leaving a very fine pure wool material.

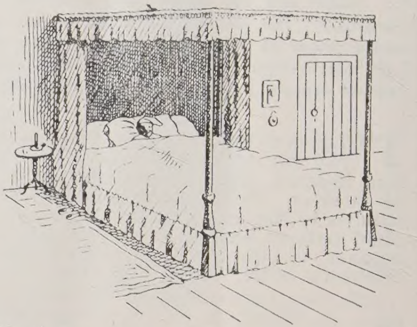
Pyjamas are by no means the monopoly of men, and leading fashion houses find wool an inspiring medium for attractive designs for women's wear, one of the most popular fabrics used being wool taffeta, which is very fine and soft.

Comfort in Sleep

The skin never sleeps, and the virtue of wool for night garments, winter and summer, lies in its natural absorbency and its ability to keep the skin well ventilated. Wool creates and maintains an even, comforting warmth and in hot weather does not become clammy or uncomfortable. Even feather-weight wool fabrics have natural strength and elasticity which enables them to "give" comfortably and to withstand the pull on a fabric which sometimes occurs when a sleeper turns over.

Child welfare experts advise all-in-one night suits of flannel or other wool material for young children, as the warmth of wool is constant and there is less risk of a chill should bed clothes be flung off during the night. For older children, boys or girls, 2-piece pyjamas are recommended.

For many people "getting up" can never be anything but an ordeal, but the warmth of a wool dressing gown and wool-lined slippers is considerable compensation, as well as an insurance against chill.



Blankets

Blankets owe their name to the Flemish weaver Thomas Blanket, who in the severe winter of 1340 used a piece of unshorn, shaggy broadcloth as a cover for his bed. Such was the humble origin of that prince of warmth and luxurious comfort, the modern blanket.

Blankets provide the perfect example of wool's ability to give light, bulkless warmth. This is the effect of the millions of air cells entrapped in the fabric, forming one of the best insulators known. The nap on a blanket, which holds even more warmth-giving air, is brushed up after the fabric is woven, and in blankets of pure wool this nap does not mat down in washing or in wear because wool fibres are naturally springy and stay springy. Cellular blankets, of many different types, are widely recommended by doctors and ensure maximum air content with healthy ventilation. The capacity of wool to felt, which can be controlled to any degree desired, is very useful in making certain types of heavy blanket. Soft pastel shades such as peach, turquoise, primrose, and jade are seen to excellent effect in blankets, many of which are now made with reversible colours.

Another new idea is wool sheets, which in remarkably fine and smooth materials are sheer luxury on a wintry night.

Not only as a bedtime covering is wool valuable. Specially treated, it is being used increasingly as filling for mattresses, pillows, and eiderdowns, for which purposes its softness, lightweight warmth, and airiness make it ideal.

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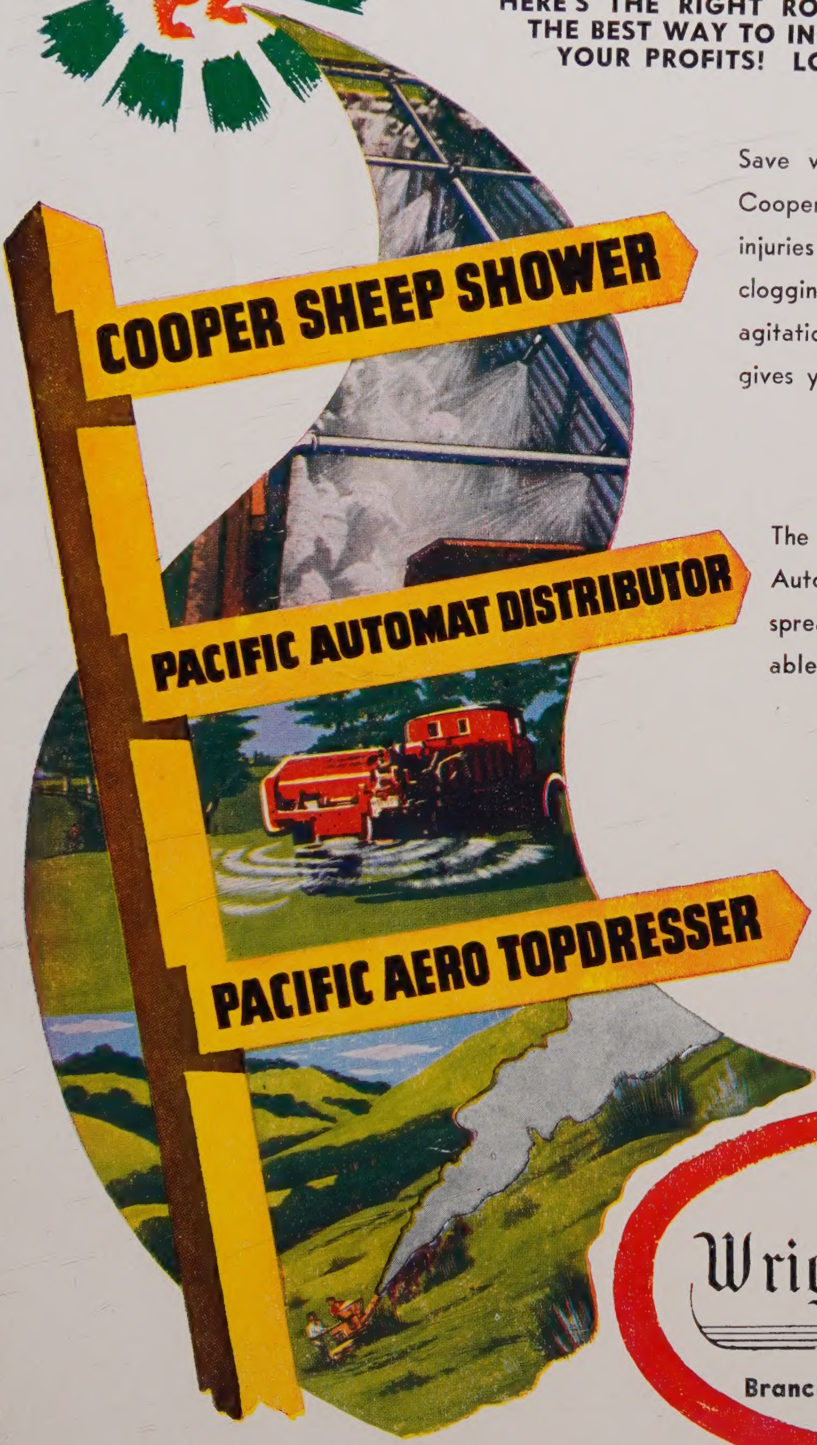

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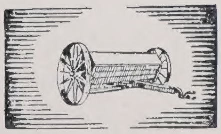

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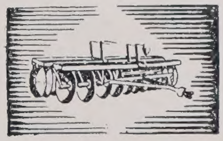

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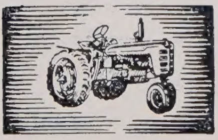

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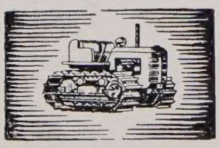

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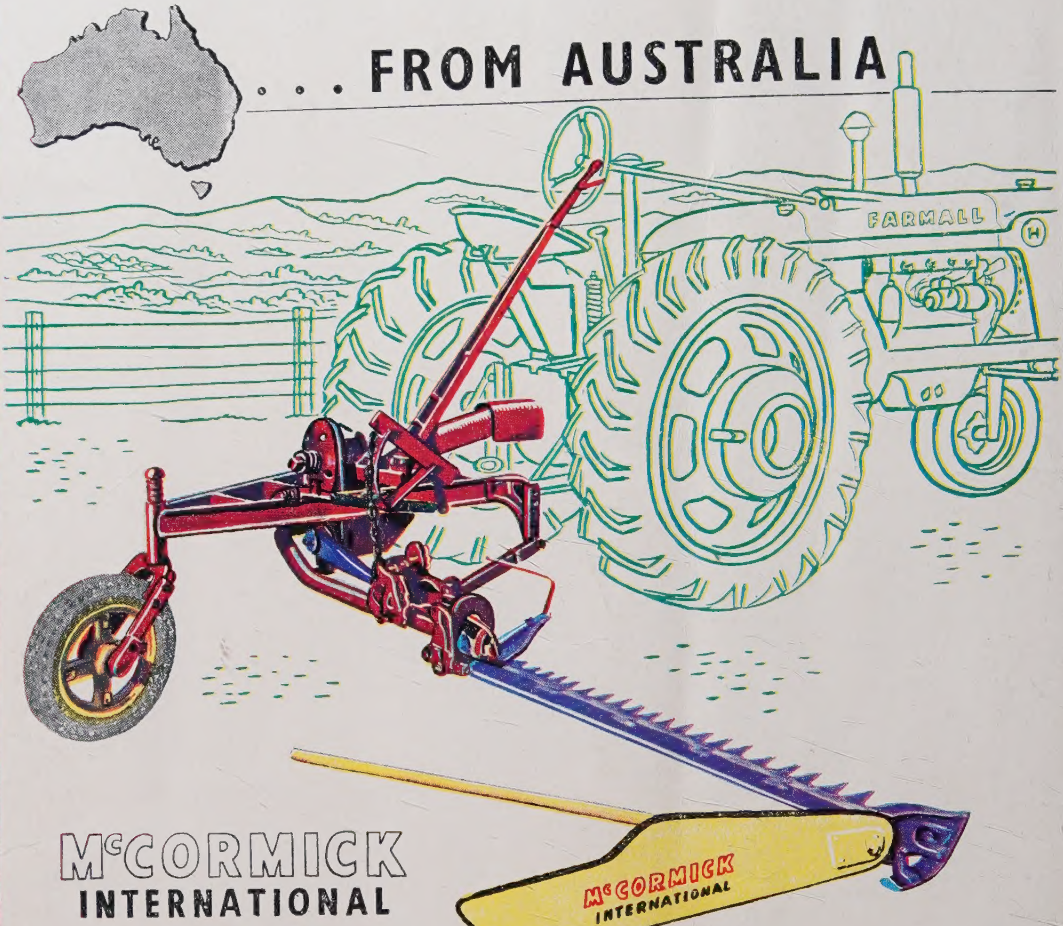

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